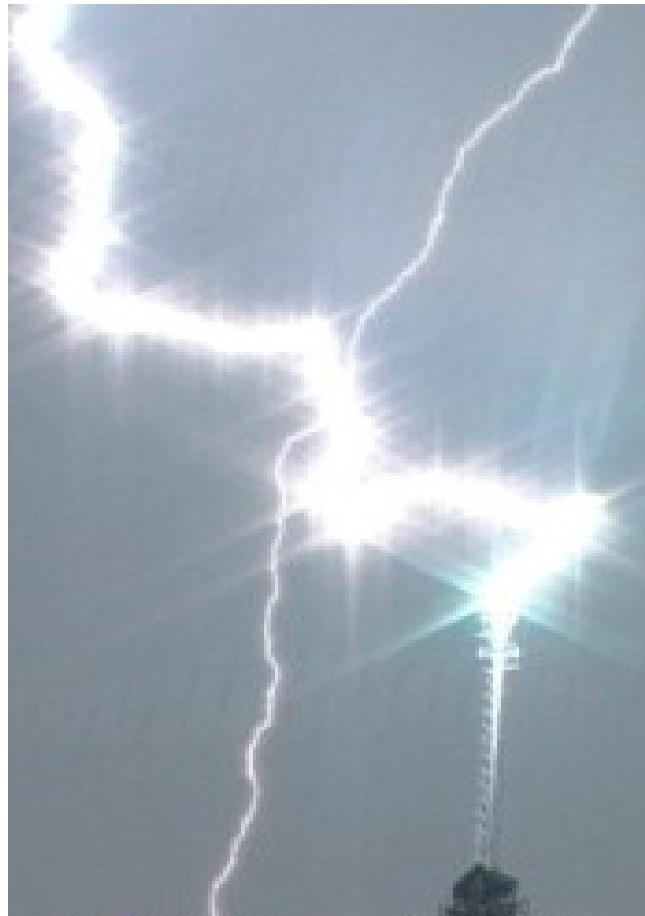


**FINAL
ENVIRONMENTAL ASSESSMENT
FOR THE
INSTALLATION OF THE VAISALA 4D
LIGHTNING DETECTION SYSTEM
IN
BREVARD, OSCEOLA, AND ORANGE COUNTIES
NORTHEASTERN FLORIDA**



August 2005

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**FINDING OF NO SIGNIFICANT IMPACT (FONSI)
AND FINDING OF NO PRACTICABLE ALTERNATIVE (FONPA)
FOR THE INSTALLATION OF THE
VAISALA 4D LIGHTNING DETECTION SYSTEM IN
BREVARD, OSCEOLA AND ORANGE COUNTIES
NORTHEASTERN FLORIDA
AUGUST 2005**

The United States Air Force (AF) proposes to install a Lightning Detection System (LDS) at nine sites; one on Cape Canaveral Air Force Station (CCAFS) on Observation Road, four at Kennedy Space Center (KSC) (Shiloh, Universal Camera Site 13, J8-1567 Beach and Orange Grove) and four offsite. These four locations offsite are: 1) Satellite Boulevard in Brevard County, 2) Deseret Ranch in Osceola County, 3) Ward Ranch in Orange County and 4) Seminole Ranch in Brevard County. This action is being proposed to display real-time, all lightning flashes within a 60 nautical mile (nmi) radius of CCAFS and individual lightning source locations within 20 nmi of CCAFS that are accurate to within 500 meters and to assure the lightning flash detection efficiency within 20 nmi of CCAFS is greater than 99% and greater than 95% within 60 nmi of CCAFS. Only one alternative to the Proposed Action was identified, the No Action Alternative. The current LDS is nearing the end of its logistical lifespan and has significant operational limitations. The data that would be received from the new LDS is required to support the evaluation of the Lightning Launch Commit Criteria and the issuance of timely and reliable warnings in support of routine ground operations.

In accordance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulation, 32 CFR 989, *Environmental Impact Analysis Process*, this Environmental Assessment (EA) evaluates the potential environmental consequences associated with the installation of the new LDS and is incorporated by reference.

Environmental Consequences of the Proposed Action

No significant environmental impacts were identified that would require the completion of an Environmental Impact Statement. Less than significant or beneficial impacts that were identified are summarized below.

Air Quality

Construction activities associated with the Proposed Action would produce short-term, intermittent air quality impacts by suspending particulate matter and producing other common air pollutants (i.e., nitrogen oxides, carbon monoxide and sulfur dioxide) from construction equipment.

Biological Resources

Several Threatened and Endangered (T&E) species and Species of Special Concern (SSC) have been identified or may occur in the vicinity of the Proposed Action sites.

The Proposed Action areas also provide habitat for numerous birds that are protected by the Migratory Bird Treaty Act. The AF has consulted with the U.S. Fish and Wildlife Service (USFWS) regarding potential impacts to migratory birds and Federal-listed T&E species and SSC and received a Biological Opinion (BO) for the Proposed Action activities at CCAFS. The National Aeronautics and Space Administration environmental office has also reviewed the project sites on KSC and determined that consultation would not be required for those sites on KSC because T&E species will not be impacted.

Project activities on Sites 3 and 5, would result in the clearing and grubbing of predominantly non-native communities. Sites 1, 2, 4, 6 and 8 are partially or completely vegetated with natural communities. At Sites 4 and 5, native trees, mostly cabbage palms, would be removed. The total number of trees to be removed would be less than 200 for the entire project.

Any exotic, invasive vegetation encountered (such as Brazilian pepper) would be properly treated on-site in accordance with the Invasive Species Management Plan and all landscaping would be approved by 45 CES/CEV. Native vegetation would be used as much as practicable.

The BO received from the USFWS regarding the installation of a lightning detection antenna on CCAFS (2004) stated the Proposed Action may result in the incidental “take” of Florida scrub jays, Southeastern beach mice and eastern indigo snakes. USFWS must be notified of any unauthorized take of these species. However, the USFWS concluded that these activities are not likely to jeopardize the continued existence of these species. No critical habitat has been designated for the three species; therefore, none will be affected.

A total of 0.28 acres of Florida scrub jay nesting habitat would be permanently lost at Site 1. However, the 30-foot cleared area outside the fence would create new caching area for the jays. Any removal of vegetation requires compensation at a rate of 4:1 (four acres restored for every acre destroyed). Therefore, 1.12 acres of compensation would be required. Should the 0.28 acres of habitat be exceeded, the USFWS would require review of the reasonable and prudent measures provided in the BO. Since this is a 45 SW project, the required compensation acreage will be taken care of through the current AF scrub restoration program. If any jays are found to be nesting in or near the project area, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or until it has been determined that the nest has failed. Once it has been determined that the nest is no longer active, then the habitat is considered not occupied by the Florida scrub jay.

The BO requires an Eastern Indigo snake protection/education plan to be developed for all construction personnel to follow on CCAFS. An Eastern Indigo snake Monitoring Report must also be submitted to USFWS within 60 days of the clearing phases if any snakes are observed or relocated at CCAFS. Only authorized personnel are permitted to come in contact with or relocate an Eastern Indigo snake.

Waters of the United States and the State of Florida, including wetlands, located on some of the Proposed Action sites would be impacted. If activities require disturbance adjacent to these areas, construction Best Management Practices, such as the erection of silt fences, would be implemented.

The St. John's River Water Management District (SJRWMD) would require one Standard General Environmental Resource Permit to cover construction activities at Sites 2 and 5. At Site 5, trenching activities associated with the installation of utility lines along both sides of a dirt access road would be covered by this permit. Additionally, at Site 5 a State Owned Sovereign Submerged Land determination is in process. The Army Corps of Engineers (ACOE) would require three separate Nationwide Permits for three activities at Sites 2 and 5 (i.e., pad construction at both sites and utility instillation at Site 5). It is anticipated that mitigation will be required on Site 5. The mitigation will be accomplished by paying toward a wetland mitigation bank. The exact amount of acreage and monetary amount will not be known until the ACOE permit package is received and reviewed. Mitigation requirements would be identified in permits issued by the SJRWMD and ACOE. It is anticipated that a local mitigation bank would be used to compensate for the loss of wetlands. Due to the siting requirements for the Lightning Detection System, wetlands cannot be avoided.

Cultural Resources

There are no known eligible National Register of Historic Places archaeological sites located within or near the Proposed Action areas.

Geology, Soil and Water Resources

Work activities have the potential to promote erosion and affect surface waters by disturbing upland and wetland areas. Best Management Practices would be followed to mitigate impacts to soils and surface waters.

Hazardous Materials and Hazardous Waste

Hazardous materials would not be used during the Proposed Action. In addition, no hazardous waste would be generated.

Health and Safety

Various safety hazards associated with heavy equipment operation would exist. All appropriate regulations, including Occupational Safety and Health Administration regulation 29 CFR 1926, *Safety and Health Regulations for Construction* would be followed during project activities, along with AF and 45 SW-specific guidance.

Infrastructure and Transportation

Any demolition debris generated would be recycled, to the maximum extent possible, to decrease the potential impacts to local landfills.

Land Use and Zoning

It is a requirement that federal activities be consistent with the enforceable policies of a coastal State's federally approved Coastal Zone Management Program. The state has concurred that this action is consistent with the Coastal Zone Management Plan.

Noise

Project activities would generate noise, which although not continuous, could be disruptive for brief periods to wildlife and individuals working in the immediate area.

Socioeconomics

An increase in local construction labor would result from implementing the Proposed Action. The demand for equipment necessary to construct the LDS would also increase.

No Action Alternative

Under the No Action Alternative, the status quo LDS program would continue. The current LDS is 13-years-old and is nearing its logistical lifespan. Additionally, the existing system has significant operational limitations. The data received from the new LDS is required to support the evaluation of the Lightning Launch Commit Criteria as well as the issuance of timely and reliable warnings in support of routine ground operations. For these reasons, the No Action Alternative is not preferred.

Cumulative Impacts

No cumulative impacts from the Proposed Action in conjunction with other planned construction activities are anticipated. The areal requirements for the Proposed Action sites are relative small when compared to typical construction projects. Construction projects when assessed together would be expected to produce more noise, greater socioeconomic benefits and the potential for impacts to T&E species, SSC, wetlands and floodplains and native vegetation communities.

Conclusion

The EA and Draft FONSI/FONPA were made available to the affected public for a 30-day public comment period beginning 5 October 2005. The affected public was notified by advertisements placed in the *Florida Today* and *Orlando Sentinel* newspapers. The EA and FONSI were also made available by placing on file in the town library of Cape Canaveral and 45 SW Public Affairs Office. No comments were received.

The Draft EA and FONSI were sent to the State Clearinghouse for review by the Florida Department of Environmental Protection, Florida Fish and Wildlife Conservation Commission, Florida Department of State, East Central Florida Regional Planning

Council, Treasure Coast Regional Planning Council, South Florida Water Management District and St. John's River Water Management District. No comments were received.

Finding of No Practicable Alternative for Activities in Floodplains and Wetlands

Executive Order 11990 directs that each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements. The proposed action would have unavoidable impacts to wetlands because selective trimming and removal of vegetation in surface waters and adjacent floodplains, including wetlands, would be required to satisfy essential mission requirements such as the construction of components located in wetlands.

Finding of No Practicable Alternative

Pursuant to Executive Orders 11990 and 11988, the authority delegated by SAFO 780-1 and 32 CFR Part 989 and taking the submitted information into account, I find that there is no practicable alternative to this action that would avoid wetlands and floodplains during construction activities and the proposed action includes all practicable measures to minimize harm to the environment.

Finding of No Significant Impact

Based on the attached EA, conducted in accordance with the Council on Environmental Quality Regulations implementing the National Environmental Policy Act of 1969 (Public Law 91-190, 42 U.S.C. §§4321-4347), as amended and 32 CFR 989, as amended, an assessment of the identified environmental effects has been prepared for the proposed installation of a Vaisala 4D Lightning Detection System. I find that the action will have no significant impact on the quality of the human environment; thus, an Environmental Impact Statement is not warranted.

13 Jan 06
Date

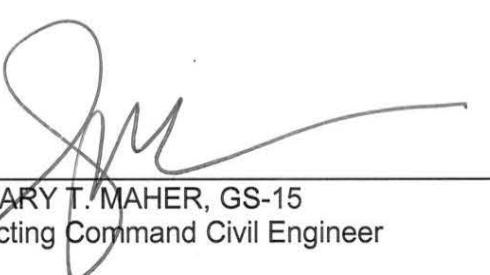

GARY T. MAHER, GS-15
Acting Command Civil Engineer

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1.0 INTRODUCTION

In accordance with the requirements of the 1969 National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations, 32 Code of Federal Regulations (CFR) 989, *Environmental Impact Analysis Process* dated March 12, 2003, and Department of Defense (DoD) Directive 6050, this Environmental Assessment (EA) evaluates the potential environmental consequences associated with the installation of a new Lightning Detection System (LDS).

1.1 Background on the Existing Lightning Systems

The existing Lightning Detection and Ranging (LDAR) system provides 45th Space Wing (45SW) personnel with an ability to characterize the 3-dimensional (3-D) extent of lightning around the Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS) area. The spatial extent of the lightning danger area is defined and the likelihood of impending cloud-to-ground lightning is estimated. LDAR is used in real-time to aid in issuing and lifting lightning advisories for KSC/CCAFS ground operations. LDAR provides trained observers with the ability to identify, isolate, and track individual cells; it can also provide indications of storm shear.

The LDAR system monitors lightning activity within a 100 kilometer (km) area around KSC and CCAFS. LDAR detects in-cloud and cloud-to-ground lightning but does not locate ground strike points or provide peak current estimates. The system detects the VHF (very high frequency) radiation emitted by lightning at a frequency of 66 MHz and locates the lightning by time-of-arrival (TOA) measurements. The system is configured with a central antenna and six remote antenna sites which continuously transmit their received signals back to the central site. The remote sites are located within a 10 km circle around the central site. If the TOA of the various sites agree within a predetermined certainty, the location of the event is plotted in a 3-D representation on the LDAR display. The 3-D accuracy of LDAR has been determined to be ± 300 meters in the x, y, and z dimensions, within 20 km of the central site. Range errors increase beyond 20 km.

Table 1-1 is a summary of the technical characteristics of the four lightning detection and location systems utilized on the 45SW's Eastern Range (ER). Each of these systems has strengths and weakness relative to the other systems. All four systems, including the LDAR, must be used in a complementary manner to fully characterize the lightning threat. The data from these systems, when combined with information from other meteorological sensors, and analyzed by trained meteorological personnel, provides the basis for issuing accurate and timely lightning warnings and forecasts. The data provided is also instrumental in evaluating the Lightning Launch Commit Criteria imposed on each launch operation at the ER. This is to ensure that launch vehicles are not at risk of intercepting either natural or triggered lightning during the first minutes of flight. The four LDSs are:

- Launch Pad Lightning Warning System (LPLWS)
- Cloud-to-Ground Lightning Surveillance System (CGLSS)
- National Lightning Detection Network (NLDN)
- Lightning Detection and Ranging (LDAR)

**Table 1-1: Technical Characteristics of the Four Lightning Detection Systems
Used on the Eastern Range**

System Characteristics	LPLWS	CGLSS	NLDN	LDAR
System type:	Field mill network	Hybrid ¹	Hybrid ¹	VHF, time-of-arrival
Number of sensors:	31	6	1052	7
Sensor spacing:	2 - 5 km	20 km	200 - 400 km	6 - 10 km
Effective range:	<20 km	100 km	National	100 km
Lightning detected:	All	Cloud-to-ground only	Cloud-to-ground	All
Flash detection Efficiency:	>90% ³	92% ⁴	80% ⁵	~ 100%
Lightning process Located:	Center of charge	Return stroke, ground strike	Return stroke, ground strike	VHF radiation
Local accuracy:	2-20 km ³	0.5 km	~ 2 km ⁵	100 m
Locations per flash:	1	1-5	~ 1 ^{5,6}	20-1000
Peak location rate:	85 min ⁻¹	74 min ⁻¹	800 min ⁻¹	10,000s ⁻¹
Display:	Stand-alone and MIDDS	Stand-alone and MIDDS	Stand-alone	Stand-alone
Source:	Locally developed	Commercial product	Commercial service	Locally developed

Source: Range Instrumentation Handbook for KSC, 2001

- 1) Integrated magnetic direction finding/time-of-arrival technology.
- 2) After network reconfiguration for hybrid magnetic direction finding/time-of-arrival sensor.
- 3) Estimated values, currently under evaluation.
- 4) With requirement for 3 3 ALDF responding with $X2 < 10$.
- 5) Based on most recent evaluation of system performance when using only magnetic direction finder technology.
- 6) System typically resolves only one ground strike point per flash.

1.2 Purpose and Need for Action

Aside from the current thirteen-year-old National Aeronautics and Space Administration (NASA) designed and installed LDAR system, which is near the end of its logistical lifespan, existing 45SW LDSs have significant operational limitations. The LPLWS has a limited lightning detection capability of approximately 20 nautical miles (nmi). The CGLSS and NLDN have much larger effective ranges but only detect cloud-to-ground lightning. The LPLWS, CGLSS, and NLDN cannot depict the full volumetric extent of the lightning. Thus, the proposed LDS is required to provide the 45SW with a comprehensive real-time view of all lightning in the launch and operations area.

The 45SW's Requirement Statement #9713401 requires the deployment of a system to display real-time all lightning flashes within a 6  mi radius of CCAFS and individual lightning source locations within 20 nmi of CCAFS that must be accurate to within 500 meters (m). The full volumetric extent of the flash must be accurate to within 1 km. It also requires the lightning flash detection efficiency within 20 nmi of CCAFS to be >99% and >95% within 60 nmi of CCAFS.

1.3 Scope of the Environmental Assessment

This EA evaluates the potential site-specific environmental consequences associated with both the 45SW's Proposed Action and the No Action Alternative to install a new LDS. KSC personnel prepared a Record of Environmental Consideration (REC) for the four Proposed Action sites on KSC, dated November 2, 2004. A Programmatic EA (PEA) entitled, *Programmatic Environmental Assessment for the Construction, Maintenance and Demolition of Communications, Wind, Water, and Camera Towers at the 45th Space Wing, Florida*, is currently being prepared that evaluates the environmental consequences associated with general construction, maintenance, and demolition activities associated with various communications towers on mainland 45SW properties in Florida.

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2.0 DESCRIPTION OF ALTERNATIVES

This Chapter describes the Proposed Action and alternative, and identifies potential environmental issues, and regulatory requirements. The only alternative considered to the Proposed Action is the No Action Alternative.

2.1 Description and Location of the Proposed Action

The proposed LDS would be located on nine separate sites (one on CCAFS, four on KSC and four in the surrounding area in Brevard, Osceola, and Orange Counties). Figures 2-1 and 2-2 identify the vicinity and precise locations of the proposed system, and Figures 2-3 through 2-9 identify the site specific locations. The four “offsite” locations are:

- Satellite Boulevard in Brevard County
- Deseret Ranch in Osceola County
- Ward Ranch in Orange County
- Seminole Ranch in Brevard County

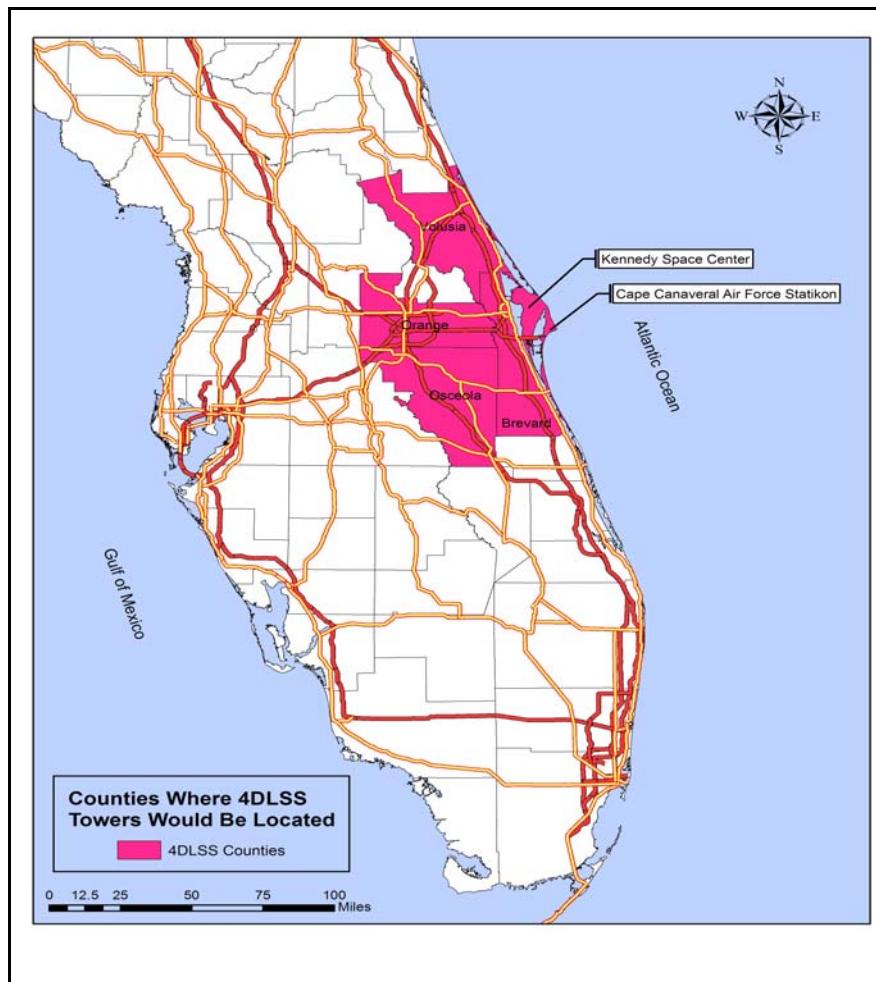


Figure 2-1: Vicinity Map



Figure 2-2: Locator Map of Proposed LDS Sites

Site 1—Observation Road on Cape Canaveral Air Force Station

The antenna would be 25-feet-high on a 3-by-3-foot concrete base with four 20-foot guy wires. Figure 2-3 is a photograph of the site.



Figure 2-3: Site 1 Observation Road

Site 2—Satellite Boulevard in Brevard County

The antenna would be 30-feet-high on a 3-by-3-foot concrete base with eight 20-foot guy wires. The property is owned by the St. John's River Water Management District (SJRWMD), who selected the site (Figure 2-4) for this sensor.



Figure 2-4: Site 2—Satellite Boulevard in Brevard County

Site 3—Deseret Ranch in Osceola County

The antenna would be 25-feet-high on a 3-by-3-foot concrete base with four 20-foot guy wires. The property is privately owned. Figure 2-5 is a photograph of the site.



Figure 2-5: Site 3—Deseret Ranch in Osceola County

Site 4—Ward Ranch in Orange County

On Site 4 (Figure 2-6), the antenna would be 25-feet-high on a 3-by-3-foot concrete base with four 20-foot guy wires. The property is privately owned.



Figure 2-6: Site 4—Ward Ranch in Orange County

Site 5—Seminole Ranch in Brevard County

The antenna would be 25-feet-high on a 3-by-3-foot concrete base with four 20-foot guy wires. The cement base at this site would be approximately 36-inches-above grade. The property (Figure 2-7) is owned by the SJRWMD.



Figure 2-7: Site 5—Seminole Ranch in Brevard County

Site 6 – Shiloh on KSC

The antenna on Site 6 (Figure 2-8) will be 30-feet-high on a 3-by-3-foot concrete base with eight 20-foot guy wires.



Figure 2-8: Site 6—Shiloh on KSC

Site 7 – Universal Camera 13 on KSC

On Site 7 (Figure 2-9), the antenna would be 25-feet-high on a 3-by-3-foot concrete base with four 20-foot guy wires. A ramp would be constructed from the top of the camera pad to the antenna.



Figure 2-9: Site 7—Universal Camera Site 13 on KSC

Site 8 – J8-1567 Beach on KSC

The antenna would be 25-feet-high on a 3-by-3-foot concrete base with four 20-foot guy wires on Site 8 (Figure 2-10).



Figure 2-10: Site 8—J8-1567 Beach on KSC

Site 9 – Orange Grove on KSC

The antenna on Site 9 (Figure 2-11) would be 30-feet-high on a 3-by-3 foot concrete base with eight 20-foot guy wires.

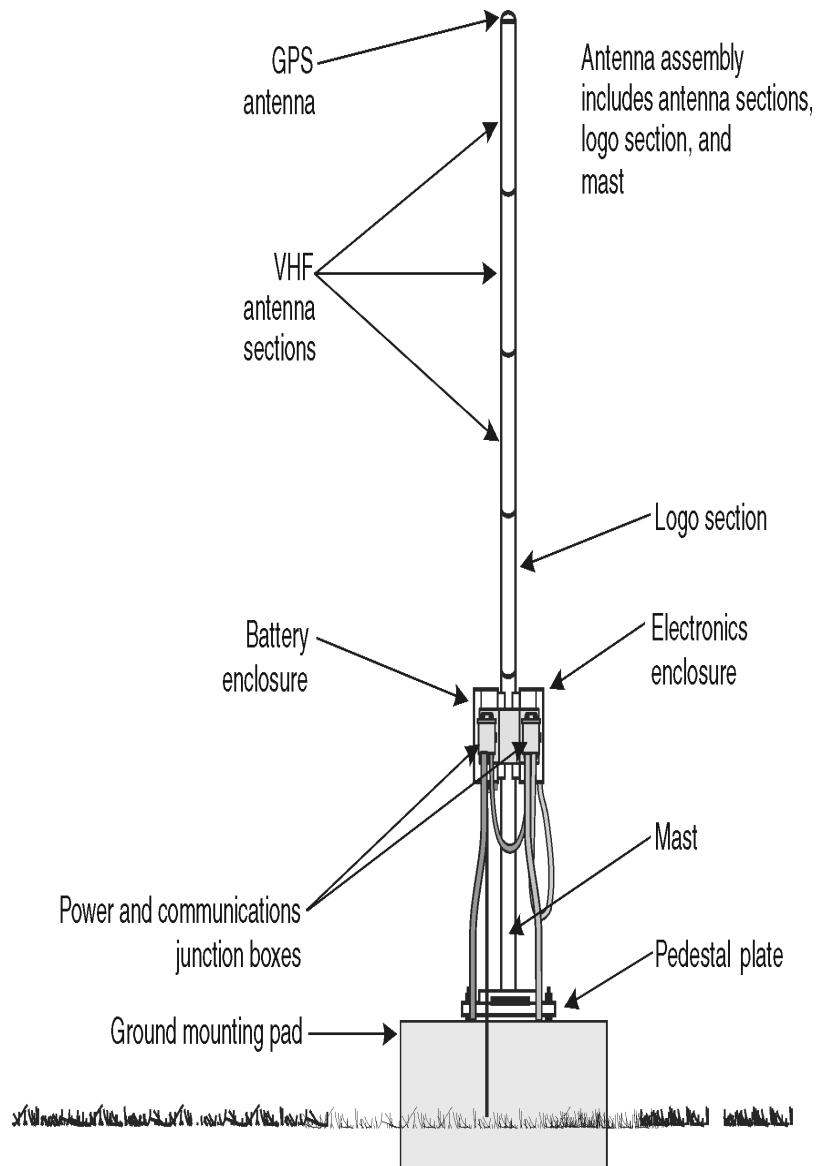


Figure 2-11: Site 9—Orange Grove on KSC

The LDS antennas would typically be mounted to a 36-inch square concrete base 36-inches below grade, and 12-inches above grade. The guy wires would be made out of Kevlar and extend out 20-feet from the center of the antenna. The typical antenna site would have power and communications hardwired. Each antenna would have two 20x13.5x8 inch junction boxes. The antenna electronics package would house a UPS battery system. There would also be two 6x6x4 inch junction boxes; one would be the communications interface and the other would be a power interface. These junction boxes would be installed approximately 4-feet above grade. Each site would also have a grounding rod system installed for protection of the antenna electronics. The antenna would be a fiberglass structure, with a 6.25-inch diameter. To accommodate each tower and the associated guy wires, a 50-by-50-foot area would be cleared at each location. In addition, a fence would be erected around the antenna and guy wires, and a 30-to-50-foot area, depending on the location, would be cleared and maintained around the outside of the fence. Figure 2-12 illustrates the configuration of a typical antenna. The following describes the particular equipment that would be installed at each site and the property ownership.



4DLSS Major Sensor Elements



Document No. 04-10571

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Figure 2-12: Typical Lightning Detection System

2.2 No Action Alternative

Under the No Action Alternative, the status quo LDS program would continue. The current LDS is 13-years-old and is nearing its logistical lifespan. Additionally, the existing system has significant operational limitations. The data received from the new LDS is required to support the evaluation of the Lightning Launch Commit Criteria as well as the issuance of timely and reliable warnings in support of routine ground operations. For these reasons, the No Action Alternative is not preferred.

2.3 Alternative Selection Process

The company that manufactures the system, Vaisala Inc., initially considered the topography of the area surrounding CCAFS/KSC and proposed that the system consist of eight remote sensor locations to meet the system performance requirements. Sites were identified based upon known locations of existing ER weather instrumentation. Vaisala ran their system performance routine and determined that an additional location was required to fill in a gap in the system performance routine; therefore, the system would consist of nine sensors. The following describes criteria that were used to determine optimal locations.

- The location of the sensors was strictly dependent on traffic related noise (e.g., cars are less of a problem than 2-cycle motor-scooters). High-traffic roads must be 100-200 meters away.
- For “clean” high voltage lines (i.e., all the bolts are tight and the insulators are clean), the LDS can be as close as 20 meters. Poorly maintained power lines can affect the sensor at 1-2 km away.
- Because the LDS sensor detects VHF signals, the path between the antenna and distant lightning must be a clear line-of-sight to avoid loss of desired signals. Trees or vegetation that blocks more than 5 degrees of horizontal view may be considered an obstruction. Therefore, the surrounding vegetation must not exceed 10-feet-in-height and a distance of 2-3 times the height of the tree must exist between the LDS and the trees.

The network is based upon the over all system requirements established by the Air Force to provide a system to display real-time all lightning flashes within a 60 nmi radius of CCAFS. The AF requires that the lightning flash detection efficiency within 20 nmi of CCAFS to be >99% and within 60 nmi of CCAFS to be >95%. Full volumetric extent of the flash must be accurate to within one km.

Given these requirements, Vaisala using their proven performance projection program, determined that the system required 9 sensors to be located at the projected locations. Each of these nine sensor locations interact with the other sensors in the system to provide the over all system performance that allows the system to meet Air Force mission requirements. Vaisala provided optimal coordinates for the sensors and during field reconnaissance surveys, a few of the locations had to be changed for various reasons. For example, one location was located in the middle of a river. Once everything was considered, the above-listed sites were selected and Radio Frequency (RF) surveys were conducted to ensure optimal performance of the system as a whole.

After receiving the proposed sensor locations, each location was visited to determine their suitability to meet the additional site selection criteria as outlined by Vaisala's site selection and planning guide. The additional criteria that were addressed included:

- Local terrain features that do not block sensor line-of-sight to storm activity (the majority of our lightning storms comes from the west, therefore the field of view is critical and the minimum Line-of-Sight Angle for the baseline distance of our system should be 5 degrees or less, i.e. an open field).
- Electrical noise and RF activity which may interfere with sensor operation and reliability (this is why an RF Site survey for each location was conducted and all of the sites provided satisfactory results).

Moving any of the 9 sites more than 100 feet requires the manufacturer to perform a new RF survey as this could result in a less than 99% detection rate, which would not satisfy the AFs requirements.

A review of the Satellite Boulevard (Site 2) and the Seminole Ranch (Site 5) locations shows that the entire surrounding area for over one mile (640+ acres) is in a flood plain. Movement of the antennas and Sites 7 and 8 would continue to place the antennae in floodplains, and movement of the antennae on Sites 4 and 7 have the potential to be located in wetlands. There is no other practical location in the immediate surrounding area that meets all of the selection criteria requirements and provides the required system performance.

Vaisala was requested to run the performance projection routine with out Sites 2 and 5. Without these sites, the system does not meet the AF requirements.

2.4 Potential Environmental Impacts Summary

Ten broad components of the human environment were initially investigated to provide a context for understanding the potential effects of the Proposed Action and as a basis for assessing the significance of potential impacts. The areas of environmental consideration were air quality; biological resources; cultural resources; geology, soil, and water resources; hazardous materials and waste; health and safety; infrastructure and transportation; land use and zoning; noise; and socioeconomic.

A comparison matrix of the potential impacts resulting from the Proposed Action to the resource areas considered is provided in Table 2-1. The three levels of impact utilized in this document are defined as follows:

- No Impact - No environmental impact is predicted.
- Not Significant Impact - An impact is predicted, but the impact does not meet the intensity/context significance criteria for the specific resource.
- Significant Impact - An impact is predicted that meets the intensity/context significance criteria for the specific resource.

No significant impacts would be anticipated from implementing the Proposed Action or the No Action Alternative. Minor impacts associated with several of the environmental components are briefly summarized below, and a more detailed analysis of potential impacts to one resource area, biological resources, is presented in Chapter 4.0.

2.4.1 Issues Eliminated from Detailed Analysis

Following a preliminary analysis in a AF Form 813, *Request for Environmental Impact Analysis*, signed in 2004 (Appendix A), the AF determined that no impacts or less than significant impacts would be anticipated to air quality; cultural resources; geology, soils, and water resources; infrastructure and transportation; noise; and socioeconomic. The following is a summary of the anticipated minor impacts associated with these categories.

Table 2-1: Environmental Impact Matrix

Environmental Components	Proposed Action	No Action Alternative
Air Quality	No Significant Impact	No Impact
Biological Resources	No Significant Impact	No Impact
Cultural Resources	No Impact	No Impact
Geology, Soils, and Water Resources	No Significant Impact	No Impact
Hazardous Materials and Waste	No Impact	No Impact
Health and Safety	No Significant Impact	No Impact
Infrastructure and Transportation	No Significant Impact	No Impact
Land Use and Zoning	No Significant Impact	No Impact
Noise	No Significant Impact	No Impact
Socioeconomics	No Significant Impact/Potential Beneficial Impact	No Significant Impact

2.4.1.1 Air Quality

Air Force Instruction (AFI) 32-7040, *Air Quality*, identifies AF requirements for an air quality compliance program. Several sources of air emissions were considered that could result from implementation of the Proposed Action. Each potential source of air pollution is reviewed below.

Vehicle Use

Vehicles would emit exhaust (carbon monoxide, nitrogen oxides, and sulfur dioxide during project activities. Dust particles (*i.e.*, particulate matter) would also be suspended during demolition and construction activities. Dust suppression techniques, such as periodic site watering would be used.

Table 2-2: Summary of Air Quality Requirements

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
AFI 32-7040	Estimate air emissions for inclusion in the Air Emissions Inventory	Track vehicle/equipment use	AF

The current CCAFS Title V Air Operating Permit would not need to be amended, as the impacts associated with the Proposed Action would be minor and are covered by the existing permits. The Proposed Action is located in counties that are in attainment with all criteria air pollutants; therefore, a conformity determination is not required. Changes in local air quality resulting from these sources would not be significant.

2.4.1.2 Cultural Resources

AFI 32-7065, *Cultural Resources Management*, provides guidelines for the protection and management of cultural resources on AF-managed lands. Cultural resources include prehistoric-archaeological, historic, architectural, and Native American resources. Areas of potential impact include properties, structures, landscapes, or traditional cultural sites that qualify for listing in the National Register of Historic Places. Section 106 of the National Historic Preservation Act of 1966 (as amended) requires federal agencies to consider the effects of their actions on historic properties.

Existing surveys do not indicate the presence of cultural resources in the Proposed Action areas on KSC and CCAFS. Surveys have not been conducted for the private properties; however, based on their past use, it is unlikely that intact cultural resources would be present in these disturbed areas. No survey, despite an intense effort and excellent research sampling strategy, precludes the possibility that an archaeological site may be discovered during subsequent clearing activities. Federal cultural resource preservation statutes mandate that if artifacts become apparent during construction or clearing, such materials should be identified and evaluated by an archaeologist. Should human remains be encountered, federal statutes specify that work shall cease immediately and the proper authorities be notified. (Federal Register, Rules and Regulations, Dec. 4, 1995, Vol. 60, No. 232:62161, Section 10.5).

Table 2-3: Summary of Cultural Resources Requirements

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
Native American Graves Protection and Repatriation Act	Report inadvertent discovery of cultural items to 45SW and cease work activities.	Protect Native American human remains, funerary objects, and sacred objects.	State Historic Preservation Office

2.4.1.3 Geology, Soils, and Water Resources

AFI 32-7041, *Water Quality Compliance*, identifies essential AF actions to achieve and maintain compliance with the Clean Water Act, and other applicable Federal, State, and local water quality standards. It requires adherence to applicable State and local water quality standards when they are more stringent than Federal standards.

Soils and Geology

The potential for erosion would be highest during construction activities. Some ground-clearing is anticipated at all locations; however, land disturbance would generally be no more than 1/10th of an acre at each location. To reduce the impacts of erosion, standard construction best management practices (BMPs) would be used. These measures include the use of silt fences, mulch, and revegetation of disturbed areas to control erosion. Because the sites are on relatively level terrain, except Site 7, which is vegetated with well-established grass, and only small areas of soil (*i.e.*, sand) would be disturbed, no significant impact to soils are anticipated, provided proper BMPs are implemented and monitored.

Water Resources

Water resources could be affected by the Proposed Action activities if soil erosion occurs from land disturbance during construction, especially on those sites that are located in or adjacent surface waters. It is anticipated that mitigation will be required on the Seminole Ranch site (Site 5). The mitigation will be accomplished by paying toward a wetland mitigation bank. The exact amount of acreage and monetary amount will not be known until the Army Corps of Engineers permit package is received and reviewed. With the proper implementation of BMPs, impacts would not be significant to local water resources.

2.4.1.4 Hazardous Materials and Waste

Hazardous materials would not be used during the Proposed Action. In addition, Hazardous waste would not be generated. No impact from hazardous materials or waste is anticipated.

2.4.1.5 Health and Safety

AFI 91-301, Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program summarizes AF requirements for the protection of health and safety. No unique health and safety requirements were identified. The requirements in Table 2-4 would be followed. No impact to health and safety would be anticipated.

Table 2-4: Summary of Health and Safety Requirements

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
Occupational Safety and Health Standards, 29 CFR 1910	Various	Protect health and safety of workers	Occupational Safety and Health Administration
Safety and Health Regulations for Construction, including Subpart T "Demolition", 29 CFR 1926			

2.4.1.6 Infrastructure and Transportation

Infrastructure and transportation includes utilities, solid waste management, and transportation networks. AFI 32-7042, *Solid and Hazardous Waste Compliance*, identifies compliance requirements for solid waste.

Utilities

Utility structures and lines would be identified prior to any excavation and a Joint-Base Operations Support Contract (J-BOSC) Excavation Permit would be obtained. Should unidentified underground utilities be encountered during excavation, operations would cease until all utilities are properly identified, and when applicable repaired.

Solid Waste

Solid waste would be generated from land clearing activities associated with the proposed activities. However, these impacts are anticipated to be negligible.

Transportation

The existing transportation systems would be used to access the site. No new roads would be constructed to access the proposed sites.

Table 2-5: Summary of Infrastructure and Transportation Requirements

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
Joint-Base Operations Support Contract Excavation/Dig Permit Procedure"	Utility Locate/Excavation Permit	Report any excavation activity	Space Gateway Support Mission Support, Excavation Administrator

No significant impacts are anticipated to infrastructure and transportation from the Proposed Action.

2.4.1.7 Land Use and Zoning

It is a requirement that federal activities be consistent with the enforceable policies of a coastal State's federally approved Coastal Management Program. A consistency determination is a review by the federal agency to determine whether the federal agency's proposed activities have any effect on coastal use or resources. They are then asked to determine whether such activities will be undertaken in a manner consistent to the "maximum practicable" with the enforceable policies of the approved management program of the state. The state will then review this proposal. The state is responsible for concurring with or objecting to the Federal Consistency Determination supplied by the agency. The Proposed Action is consistent with current land use and zoning policies of the 45SW and no impact would be anticipated.

2.4.1.8 Noise

The EPA administers the Noise Control Act of 1972, and has identified 65 dB (A-scale) as a desirable noise level for compatible land uses. This level is not regarded as a noise standard, but is a basis to set appropriate standards that should also factor in local considerations and issues.

Noise impacts from the operation of construction equipment are usually limited to a distance of 1,000 feet or less. Vehicles associated with the Proposed Action typically have a dBA between 65 and 100, at a distance of 50 feet (USEPA, 1971). The proposed project is located adjacent to a highway and there are no sensitive receptors (e.g., schools, hospitals) in the vicinity. All work activities would be confined to daylight hours to avoid nuisance noise in the evenings.

In accordance with 29 CFR 1910, protection against the effects of noise exposure would be provided. When employees are subjected to sound, exceeding those listed in Table 2-6, feasible administrative or engineering controls would be utilized. If such controls do not reduce sound levels to the levels presented in Table 2-6, hearing protection would be provided and used to reduce sound levels.

Table 2-6: Permissible Noise Exposures

Duration Per Day (Hours)	Slow Response Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

2.4.1.9 Socioeconomics

Socioeconomics are comprised of such interrelated factors as population, employment, income, temporary living quarters (during construction activities), and public finance. It is not anticipated that the Proposed Action will affect employment patterns on a permanent basis or induce substantial growth or growth-related impacts. No increase in population levels would results. A minor positive socioeconomic effect would be anticipated from the Proposed Action by generating demand for short-term construction labor and materials to support the project.

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3.0 AFFECTED ENVIRONMENT

In compliance with NEPA and CEQ guidelines, this Chapter describes the existing environment of the Proposed Action areas for those resources/categories that were not previously eliminated from further analysis in Chapter 2. This information serves as a baseline from which to identify and evaluate potential environmental changes resulting from implementation of the Proposed Action. The only resources addressed in this Chapter are biological resources.

3.1 Biological Resources

The following information was collected during site visits and interviews. Biological resources covered in this section include native and non-native vegetation communities and special-status species. Vegetation communities include both upland and wetland habitats. Special-status species include species of special concern (SSC), threatened and endangered species (T&E), and migratory birds.

3.1.1 Plant Communities

The Proposed Action would be completed on 9 separate sites (Figure 2-2). The following is a brief summary of the vegetation present on each site.

Site 1

Site 1 is located in land management unit 88 on CCAFS, which was cut and burned in 2002. This site is vegetated with bunch grasses, scrub oaks, saw palmetto, and prickly pear cactus.

Site 2

Typical wetland species such as dock, bedstraw, plantain, rabbit foot's grass, rushes, and sedges are present on this site. Clumps of Brazilian pepper and cabbage palms occur in the drier portions of the site.

Site 3

This site is located in the middle of an active cow pasture and is vegetated with common grasses, such as sage grass and Bermuda grass.

Site 4

Common grasses, rushes, and saw palmetto are present on this site.

Site 5

Ragweed dominates this area. Plantain, rabbit's foot grass, and Bermuda grass are also present. Cabbage palms surround the site.

Site 6

Cabbage palms, lantana, and slash pines occur on this site.

Site 7

Site 7 is on an existing mowed and maintained Universal Camera Site.

Site 8

Site 8 is located adjacent to sand dunes. This site consists of disturbed beach grassland/coastal strand that has previously been cleared.

Site 9

Site 9 was recently cleared and is located in an active orange grove.

3.1.2 Wetlands and Floodplains

Wetlands are the transition zones between dry upland ecosystems and deeper aquatic habitats. Each wetland area is unique according to its surrounding geologic, hydrologic, and climatic conditions. Wetlands are important to maintaining the health of naturally watery places; they provide flood control, aquifer recharge, coastal protection, and act to help filter pollutants from the ecosystem. Wetlands often support a wide range of rare and endangered aquatic plants and wildlife, and humans have relied on wetlands as a source of food and recreation for centuries.

A floodplain is the lowland adjacent to a river, lake, or ocean. Floodplains are designated by the frequency of the flood that is large enough to cover them. Flood frequencies, such as the 100-year flood, are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur.

National Wetland Inventory (NWI) wetlands and/or floodplains are present on 5 of the Proposed Action areas (Sites 2,4,5,7 and 8). Figures 3-1 through 3-5 illustrate the relative locations of these features to the Proposed Action areas.

3.1.2.1 Wildlife

Various species of wildlife inhabit, utilize, or frequent the Proposed Action areas. Small mammals, amphibians, reptiles, and birds may use the sites for foraging, loafing, and in some cases breeding.

3.1.2.2 Migratory Birds

The Proposed Action areas are located along one of the major migratory flyways for neo-tropical migrants that breed in eastern North America. Due to the diversity of habitats, various migratory birds could use the sites, especially those containing native upland and/or wetland habitats. An active osprey nest with chicks was spotted on an elevated platform within 100 feet of Site 7 in an adjacent wetland.

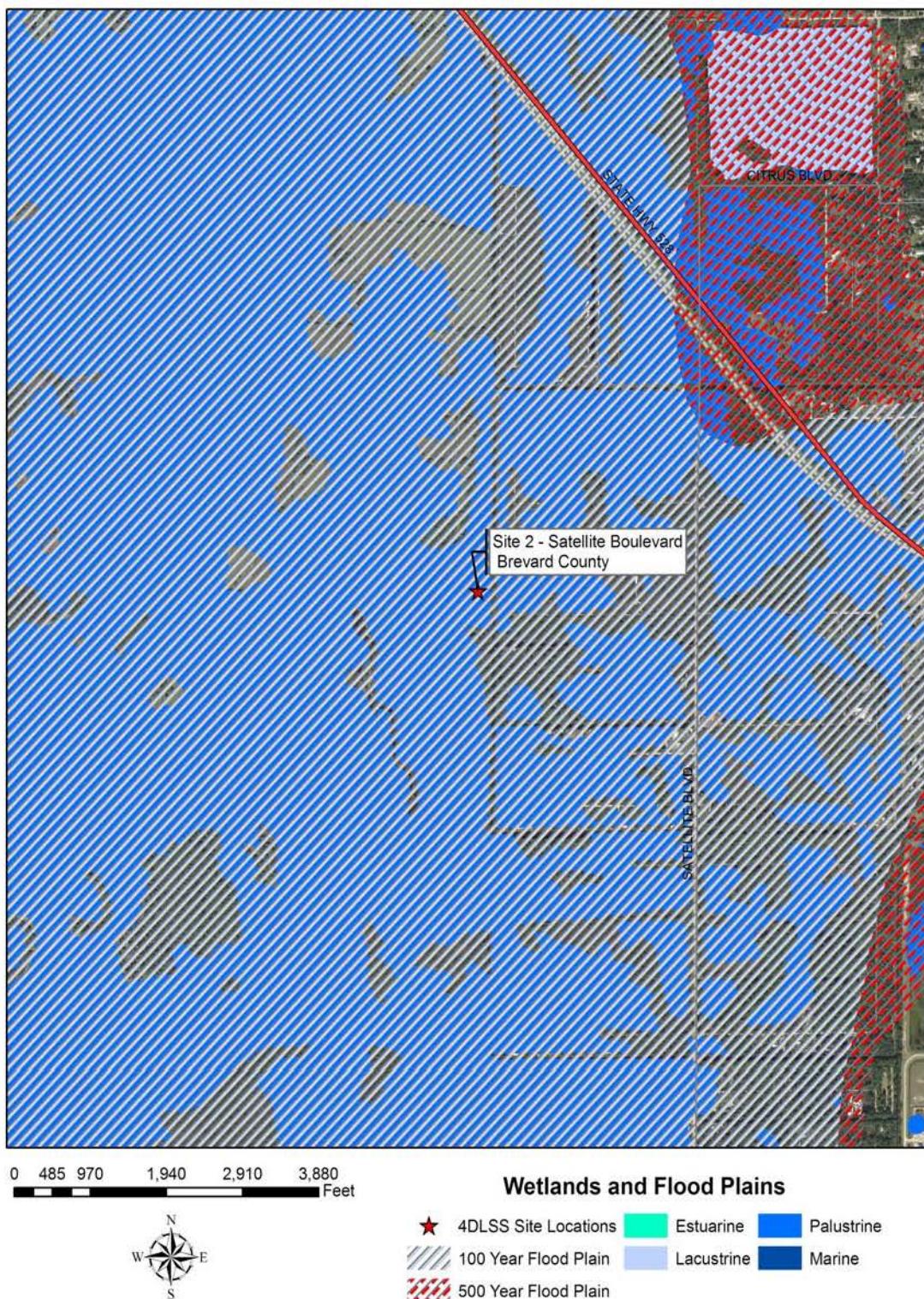


Figure 3-1: Wetlands and Floodplains for Site 2



Figure 3-2: Wetlands and Floodplains for Site 4

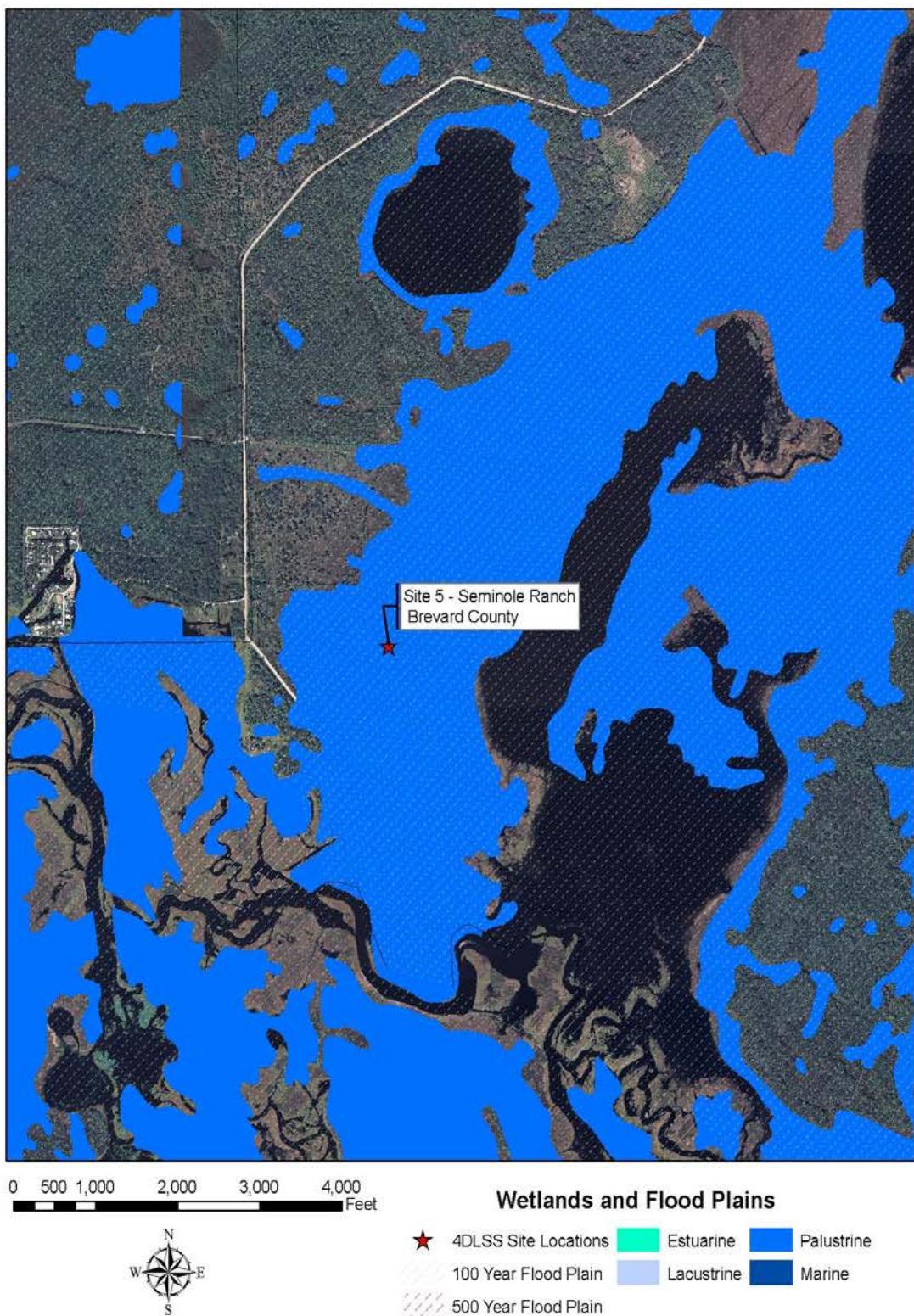


Figure 3-3: Wetlands and Floodplains for Site 5



Figure 3-4: Wetlands and Floodplains for Site 7



Figure 3-5: Wetlands and Floodplains for Site 8

Threatened and Endangered Species and Species of Special Concern

State-listed Threatened and Endangered (T&E) plants such as beach star, coastal vervain, east coast lantana, and sea lavender could be present on Sites 1 and 8. Table 3-1 provides a summary of the listing status of such species.

Table 3-1: Status of Threatened and Endangered Plants

Common Name	Scientific Name	Status
		FDA ¹
Curtiss' milkweed	<i>Asclepias curtissii</i>	E
Sand dune spurge	<i>Chamaesyce cumulicola</i>	E
Satinleaf	<i>Chrysophyllum oliviforme</i>	T
Florida lantana	<i>Lantana depressa</i> var. <i>floridana</i>	E
Nodding pinweed	<i>Lechea cernua</i>	T
Nakedwood, Simpson's stopper	<i>Myrcianthes fragrans</i>	T
Hand fern	<i>Ophioglossum palmatum</i> (<i>Cheiroglossa palmata</i>)	E
Shell mound prickly-pear cactus	<i>Opuntia stricta</i>	T
Beach star	<i>Remirea maritime</i>	E
Scaevola, inkberry	<i>Scaevola plumieri</i>	T
Sea lavender	<i>Tournefortia gnaphalodes</i> (<i>Argusia gnaphalodes</i>)	E
Coastal vervain	<i>Verbena maritime</i> (<i>Glandularia maritima</i>)	E

¹Chapter 5B-40 FAC, 2003

E= Endangered T= Threatened

Several T&E animals and Species of Special Concern (SSC) may occur in the vicinity of the project area: roseate spoonbill, piping plover, little blue heron, reddish egret, snowy egret, tricolored heron, white ibis, southeastern American kestrel, Arctic peregrine falcon, American oystercatcher, bald eagle, wood stork, brown pelican, black skimmer, and least tern. However, not all of these T&E and/or SSC would be found near all of the sites. There is no formally designated critical habitat in the Proposed Action areas, as defined under Section 4 of the Endangered Species Act. Table 3-2 provides a summary of the listing status of these species.

Three federally protected species, the Florida Scrub-jay, Southeastern Beach Mouse, and the Eastern Indigo Snake are known to utilize the CCAFS site on Observation Road and/or the adjacent areas. Due to the presence of the species, consultation with the U.S. Fish and Wildlife Service (USFWS) was required.

**Table 3-2: Status of Threatened and Endangered Animals and
Species Of Special Concern**

Common Name	Scientific Name	Status	
		USFWS ¹	FFWCC ²
Gopher Tortoise	<i>Gopherus polyphemus</i>		SSC
Eastern Indigo Snake	<i>Drymarchon corais couperi</i>	T	T
Florida Pine Snake	<i>Pituophis melanoleucus mugitus</i>		SSC
Roseate Spoonbill	<i>Ajaia ajaja</i>		SSC
Florida Scrub jay	<i>Aphelocoma coerulescens</i>	T	T
Piping Plover	<i>Charadrius melanotos</i>	T	T
Little Blue Heron	<i>Egretta caerulea</i>		SSC
Reddish Egret	<i>Egretta rufescens</i>		SSC
Snowy Egret	<i>Egretta thula</i>		SSC
Tricolored Heron	<i>Egretta tricolor</i>		SSC
White Ibis	<i>Eudocimus albus</i>		SSC
Peregrine Falcon	<i>Falco peregrinus</i>		E
Southeastern American Kestrel	<i>Falco sparverius paulus</i>		T
American Oystercatcher	<i>Haematopus palliatus</i>		SSC
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	T
Wood Stork	<i>Mycteria Americana</i>	E	E
Brown Pelican	<i>Pelecanus occidentalis</i>		SSC
Black Skimmer	<i>Rynchops niger</i>		SSC
Least Tern	<i>Sterna antillarum</i>		T
Southeastern Beach Mouse	<i>Peromyscus polionotus niveiventer</i>	T	T
Florida Mouse	<i>Podomys floridanus</i>		SSC

¹USFWS

E=Endangered: species in danger of extinction throughout all or a significant portion of its range.

T=Threatened: species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

T(S/A) =Threatened due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.

²FFWCC

SSC=Species of Special Concern

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4.0 ENVIRONMENTAL CONSEQUENCES

This Chapter describes the potential environmental impacts to Biological Resources associated with the activities of the Proposed Action and the No Action Alternative. Federal, State, and local environmental laws and regulations were reviewed to assist in determining established thresholds for assessing environmental impacts (if any) in fulfillment of NEPA requirements. Proposed activities were evaluated to determine their potential to result in significant environmental consequences using an approach based on the interpretation of significance outlined in the CEQ regulations for implementing the procedural provisions of NEPA (40 CFR 1500-1508) and 32 CFR 989, *The Environmental Impact Analysis Process* (2003).

Guidelines established by the CEQ (40 CFR 1508.27) specify that significance should be determined in relationship to both context and intensity (severity). The assessment of potential impacts and the determination of their significance are based on the requirements in 40 CFR 1508.27. Three levels of impact can be identified:

- No Impact - No environmental impact is predicted
- Not Significant Impact - An impact is predicted, but the impact does not meet the intensity/context significance criteria for the specific resource
- Significant Impact - An impact is predicted that meets the intensity/context significance criteria for the specific resource

Factors contributing to the intensity or severity of the impact include the following:

- The degree to which the action affects public health or safety;
- Unique characteristics of the geographic area such as proximity to cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;
- The degree to which effects of the action on the quality of the human environment are likely to be highly uncertain or controversial;
- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration
- Whether the action is related to other actions with individually insignificant, but cumulatively significant impacts;
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed or eligible for listing on the NRHP, or may cause loss or destruction of significant scientific or cultural resources;
- The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the ESA; and
- Whether the action threatens to violate a federal, state, or local law or requirements imposed for environmental protection.

Thresholds for determining impact significance are based on the applicable compliance standard. When feasible, these criteria correspond to federal- or state-recognized criteria, and are determined using the associated standardized methods. In the absence

of a compliance standard, the thresholds are based upon a federal- or state-recommended guidance or professional standards/best professional judgment.

4.1 Biological Resources

The AF is committed to the long-term management of all natural areas on its installations, as directed by AFI 32-7064, *Integrated Natural Resources Management*. Long-term management objectives are identified in the 45SW's *Integrated Natural Resource Management Plan* (INRMP), which is currently being updated. Specific land-management objectives are identified in the Scrub Jay and Sea Turtle Management Plans located in the appendices of the INRMP. Due to the number of migratory birds and federal-listed T&E species and SSC that may be present in the vicinity on CCAFS, CCAFS was required to consult with the USFWS. CCAFS received a Biological Opinion for the Proposed Action activities located on CCAFS. NASA determined there would be no impacts to T&E and/or SSC on their property. Therefore, no consultation was required.

4.1.1 Proposed Action

4.1.1.1 Vegetation Communities

Project activities on Sites 3, 5, 7, and 9 would result in the clearing and grubbing of predominantly non-native communities. Sites 1, 2, 4, 6, and 8 are partially or completely vegetated with natural communities. At Sites 4, 5, and 6, native trees, mostly cabbage palms, would be removed. At Site 6, over 20 slash pines would also be removed. The total number of trees to be removed would be less than 200 for the entire project.

Any exotic, invasive vegetation encountered (such as Brazilian pepper) would be properly treated on-site in accordance with the Invasive Species Management Plan, and all landscaping would be approved by 45CES/CEV. Native vegetation would be used as much as practicable.

4.1.1.2 Wetlands and Floodplains

Several of the Proposed Action areas are situated in a floodplain and/or wetland. State-jurisdictional wetlands as defined in F.A.C. 62-340 and waters of the U.S. as defined in 33 CFR 328.1 would not be filled or otherwise disturbed by project activities before the attainment of applicable permits from the State of Florida and the Army Corps of Engineers. In accordance with AFI 32-7064, where work activities occur in the vicinity of wetlands, a delineation would be performed prior to project activities to determine the boundaries of jurisdictional waters/wetlands as they can differ from those identified on the NWI map presented in Chapter 3.

The SJRWMD would require one Standard General Environmental Resource Permit to cover construction activities at Sites 2 and 5. At Site 5, trenching activities associated with the installation of utility lines along both sides of a dirt access road would be covered by this permit. Additionally, at Site 5 a State Owned Sovereign Submerged Land determination is in process.

The Army Corps of Engineers (ACOE) would require three separate Nationwide (NW) Permits for three activities at Sites 2 and 5 (i.e., pad construction at both sites and utility installation at Site 5). The following NW Permits are being sought:

- NW 5 - Scientific Devices provided fill is limited to 25 cubic yards;
- NW 12 - Utility Line Activities provided no change in preconstruction contours occur; and
- NW 18 - Minor Discharges provided fill is less than 0.1 acre.

Mitigation requirements would be identified in permits issued by the SJRWMD and ACOE. It is anticipated that mitigation will be required for Site 5 through payment toward a local wetland mitigation bank. The mitigation requirements are expected to be less than one acre.

4.1.1.3 Wildlife

Noise rather than the sight of machines appears to cause disturbance to wildlife. The combination of increased noise levels and human activity would likely cause temporary displacement of some animals that forage, feed, nest, or have dens within a 15-meter radius (or greater for more sensitive species) of noise sources. Direct mortality of slow-moving or nesting animals could occur because of project actions (e.g., excavation of burrows or removal of nests during clearing).

In order to avoid attracting wildlife to the work site, the contractor would keep the construction area, including storage areas, free from accumulation of waste materials and rubbish at all times. All waste materials would be hauled off at the end of each workday and disposed. Upon completion of the work, the contractor would leave the work site in a clean and neat condition, satisfactory to the Contracting Officer.

4.1.1.4 Migratory Birds

Vegetation removal activities would not be conducted during the main nesting season in areas where migratory bird nests are found, unless a critical need to assure mission requirements are met arises. If necessary, natural resource managers performing migratory bird nest/egg removal are permitted under Federal Fish and Wildlife Depredation Permit MB841530-0, however, a take of migratory birds is not anticipated. Informal consultation with USFWS that no formal consultation would be required for this Proposed Action because adverse affects were not likely to occur (Appendix C).

Should migratory bird nests/eggs be required to be removed, transportation of live birds or eggs would be conducted in a manner that reduces harm or stress to the animal or egg involved. It is possible, but highly unlikely, that some bird nests would be inadvertently destroyed during project activities.

4.1.1.5 Threatened and Endangered Species and Species of Special Concern

Gopher Tortoise and Eastern Indigo Snake

Active gopher tortoise burrows were identified on Sites 1 and 8. Indigo snakes are associated with gopher tortoises because they often use their burrows as refuges, possibly from temperature, desiccation, and predators. Tortoises on Site 1 would be relocated prior to any construction activities. The location of the antenna at Site 8 was moved slightly to avoid the one tortoise burrow that was observed, and no impacts are

anticipated to gopher tortoises at Site 8. Prior to construction activities, CEVP will conduct follow-up surveys to ensure no gopher tortoises inhabit the proposed locations.

When activities are scheduled near tortoise habitat, but individual burrows would not be disturbed, natural resource personnel will stake off the area that must be avoided and provide tortoise informational posters. Although never observed, slow moving gopher tortoises could be run over by heavy equipment. Concerns regarding heavy equipment collapsing and entombing them inside of their burrows have been dismissed based on studies by the Florida Fish and Wildlife Conservation Commission (FFWCC) (Joan Berish, pers. comm.).

If activities are likely to disturb gopher tortoise burrows, qualified biologists would relocate tortoises to other suitable areas on CCAFS or KSC. For example, turtles relocated from sites on CCAFS would be relocated to alternate sites on CCAFS. The same method of relocation would apply to KSC. Biologists at CCAFS and KSC would be responsible for relocating tortoises from their sites. They would move tortoises no more than one to two days prior to clearing so that tortoises can be moved back close to their original area. All tortoise relocation will be completed in accordance with the Gopher Tortoise Relocation Permit (WR01103), issued to the AF. This permit, which was renewed 5 May 2004, allows natural resource managers to relocate up to 150 tortoises during a three-year period. Trapping is conducted by experienced personnel and in accordance with required State permits for these types of activities. Although rare, tortoises have been injured or killed during backhoe operations. If a tortoise is injured during relocation activities, it will be transported immediately to a licensed local wildlife rehabilitator or veterinarian experienced in treating injured tortoises. If injured or killed, the FFWCC would be immediately notified. Tortoises held overnight will be kept isolated from one another to prevent the spread of Upper Respiratory Tract Disease. Blood sampling will be conducted by experienced biologists and in accordance with FFWCC guidelines. Animals will be handled briefly and gently to reduce harm or stress to the animal. The AF is required to submit a report for each relocation project.

Most indigo snakes leave construction areas once activities begin and any encountered are to be left alone and permitted to leave on their own. The only time indigo snakes may be relocated is during relocation of gopher tortoises. In accordance with the AF Gopher Tortoise Relocation Permit, no more than one indigo snake encountered may be relocated. Should additional specimens of this species be encountered, the capture operation is suspended and the FFWCC office in Tallahassee contacted for instructions.

According to the Biological Opinion (BO) received from USFWS for the Proposed Action site on CCAFS, an Eastern Indigo snake protection/education plan must be developed for all construction personnel to follow. An Eastern Indigo snake Monitoring Report must also be submitted to USFWS within 60 days of the clearing phases if any snakes are observed or relocated on CCAFS. Only authorized personnel are permitted to come in contact with or relocate an Eastern Indigo snake.

On KSC, any relocation activities must be performed prior to commencement of this project. If any indications of activity by the Eastern Indigo snake are present in the project areas at KSC (e.g., burrows), the burrows must be identified and avoided.

Florida Scrub Jay

The USFWS considers CCAFS and KSC to be a core scrub jay area and highly valuable to the recovery of the species, regardless of the scrub condition. A survey of the sites on KSC conducted by the NASA environmental office determined no scrub jays were

present, and therefore consultation was not required. NASA also determined that compensation would not be required because no clearing was required in the project locations.

A total of 0.28 acres of jay nesting habitat would be permanently lost at Site 1. However, the 30-foot cleared area outside the fence would create new caching area for the jays. Any removal of vegetation requires compensation at a rate of 4:1 (four acres restored for every acre destroyed). Therefore, 1.12 acres of compensation would be required. Since this is a 45SW project, the required compensation acreage will be taken care of through the current AF scrub restoration program. Should the 0.28 acres of habitat be exceeded, the USFWS would require review of the reasonable and prudent measures provided in the BO.

The BO received from the U.S. Fish and Wildlife Service (USFWS) regarding the installation of a lightning detection antenna on CCAFS (2004) stated the Proposed Action may result in the incidental "take" of Florida scrub jays. Because the BO establishes the incidental take, an Incidental Take Permit is not required. However, USFWS must be notified of any unauthorized take of these species. However, the USFWS concluded that these activities are not likely to jeopardize the continued existence of these species. No critical habitat has been designated for the three species; therefore, none will be affected.

If any jays are found to be nesting in or near the project area, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or until it has been determined that the nest has failed. Once it has been determined that the nest is no longer active, then the habitat is considered not occupied by the Florida scrub jay. Should any dead Florida scrub jays be found on the project site, the specimen should be thoroughly soaked in water and frozen, and the USFWS Jacksonville Field Office contacted immediately.

Southeastern Beach Mouse

Sites 1 and 8 are located in habitat that could be occupied by the southeastern beach mouse. Small mammal burrows were observed at both sites. It is possible that these are southeastern beach mice burrows. The BO received from USFWS for the Proposed Action requires activities to avoid the potential for the Southeastern Beach Mouse to be injured or killed by heavy equipment and the destruction of burrows. Should any unauthorized take of the species occur, the animal must be frozen and the USFWS must be notified as soon as possible.

State-Listed Plants

Chapter 7 of AFI 32-7064, *Integrated Natural Resources Management*, requires the AF to protect State-listed endangered, threatened, or rare species, when possible. The 45SW recognizes the importance of State-listed and rare species and would make all practical attempts to protect and conserve these species and their habitats.

Table 4-1: Summary of Biology Resources Requirements

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
Endangered Species Act	Consultation with US Fish and Wildlife Service (USFWS), and if necessary, obtain and comply with biological opinions/incidental take permits, comply with existing Threatened and Endangered (T&E) permits	Conserve ecosystems that support T&E species. Section 7 requires Federal agencies to insure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.	USFWS
Executive Orders (EOs) 11988 and 11990, Floodplain Management and Protection of Wetlands	Finding Of No Practicable Alternative (FONPA) if wetlands or floodplains would be impacted	Minimize the destruction, loss or degradation of wetlands, and preserve and enhance the natural and beneficial values of wetlands. Reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains. Consider alternatives to avoid adverse effects in floodplains. If the only practicable alternative requires siting in a floodplain, design or modify action to minimize potential harm to or within the floodplain.	DoD
EO 13112, Invasive Species	Various	Prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause.	DoD
Biological Opinion FWS Log No: 05-362	Comply with Biological Opinion	Survey areas prior to clearing to determine if there are any active scrub-jay nests located within the vegetation. If an active nest is located, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or the nest has failed. Prior to land-clearing, 1.12 acres of scrub habitat has to be restored onsite or plans to restore made available to USFWS. Preserve any dead Florida Scrub-jays or Southeastern Beach Mice and notify USFWS immediately. Develop an Eastern Indigo Snake Protection/Education Plan, and provide to USFWS for review. Only allow authorized individuals to come in contact with or relocate the Eastern Indigo Snake. Snakes only allowed in captivity long enough to transport them to a release site with no two snakes occupying the same container during transport. Submit an Eastern Indigo Snake monitoring report to USFWS within 60 days of clearing activities if any Eastern Indigo Snakes are observed or relocated.	USFWS

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
Migratory Bird Treaty Act	Consult with USFWS as necessary and comply with applicable permits	Prohibits destruction of the eggs or nest of migratory birds without a permit.	USFWS

4.1.2 No Action Alternative

Under the No Action Alternative, the proposed LDS would not be used. No impacts to biological resources would be anticipated as a result of the No Action Alternative.

4.2 Cumulative Impacts

A “cumulative impact” is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time. For the tower sites located offsite and the sites located on KSC (Sites 2 through 9), there are no past, present, or foreseeable projects that cause cumulative impacts in these areas. The following proposed projects identified by SGS Master Planning were considered in the cumulative impacts analysis for Site 1 on CCAFS:

Project 1 – Activation of three facilities for the long term bulk storage of hypergols, at Fuel Storage Area 1, located west of Samuel C. Phillips Parkway between Mission Control Road and Lighthouse Road. These facilities presently exist but their activation for storage of hypergols would require their evaluation under the Environmental Impact Analysis Process (EIAP). Construction for the activation of these facilities could start as early as 2006.

Project 2 – Construction of various facilities at the Cape Canaveral AFS Skid Strip. Construction is estimated to occur in the year 2010. The plan includes two locations for a new apron (sized to accommodate four “heavy” launch vehicles), a 97-foot high air traffic control tower, a Base Operations building, and a 90-foot high hangar. Two locations are under consideration for this project: 1) south of the Skid Strip, would result in the paving of approximately 59 acres; and 2) north of the Skid Strip and existing apron, would require the paving of approximately 60 acres. Option 2) would impact the serviceable life of the landfill. Both options would require approximately 24 cubic acres of stormwater retention. This project would adversely impact Florida scrub-jay habitat and would be added into the total cost for scrub-jay mitigation (see Appendix C for maps of Scrub Restoration Burn Plan and Treated Burn Units).

Project 3 – Construction of a new Eastern Processing Facility to support processing of National Reconnaissance Office (NRO) payloads. Construction is planned for the year 2005. This facility is proposed on the corner of Samuel C. Phillips Parkway and Lighthouse Road.

A preliminary evaluation of these projects suggests that potential cumulative adverse impacts would occur for biological resources. The Proposed Action would result in the permanent loss of approximately 0.28 acres of Florida scrub jay habitat. Project 2 would result in the permanent loss of up to 59 acres of scrub jay habitat, which has undergone restoration under scrub restoration guidelines. Project 3 would result in the permanent loss of 45 acres of scrub jay habitat.

When evaluated together, the Proposed Action, Project 2 and Project 3, would result in a reduction of available breeding habitat and reduction in the availability of scrub habitat for restoration. Thus, cumulative adverse impacts on the federally threatened Florida scrub-jay would occur. Through the formal Section 7 consultation with the USFWS, it was determined that cumulative impacts do not apply in this instance.

4.3 Energy Requirements and Conservation Potential

Energy requirements to support the Proposed Action would not be significantly greater than that utilized by the AF and contractors to carry out current activities. Existing energy sources are considered adequate to meet the requirements of the Proposed Action.

4.4 Natural or Depletable Resource Requirements and Conservation Potential

Diesel and unleaded fuels and engine oil would be required to power project equipment. Other than the use of vehicle fuels for project activities, the Proposed Action requires no significant use of natural or depletable resources.

4.5 Irreversible or Irretrievable Commitment of Resources

Although the Proposed Action would result in some irreversible and irretrievable commitment of resources such as fuel and labor, this commitment of resources is not significantly different from that necessary to support current mission activities taking place on 45SW-managed lands.

4.6 Adverse Environmental Effects that Cannot be Avoided

Adverse environmental effects that cannot be avoided include temporary, intermittent emissions of fugitive dust and exhaust products; temporary displacement of wildlife during construction due to noise and project activities; destruction of existing upland and wetland vegetation; loss of habitat for T&E species and SSC; and sediment runoff into waterbodies. However, through implementation of the mitigation measures described within this document, these effects would be reduced to a less than significant level.

4.7 Relationship Between Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

The Proposed Action would eliminate the availability of small parcels of land. The Proposed Action would be undertaken in accordance with the CCAFS General Plan (AF, 2002) that serves as a management tool to aid in making operational support decisions by incorporating the concept of comprehensive planning.

4.8 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Environmental Justice analysis need be applied only to adverse environmental impacts

(AF, 1997). Based on preliminary guidance provided by the Federal Interagency Working Group on Environmental Justice, adverse may be defined as "having a deleterious effect on human health or the environment that is significant, unacceptable, or above generally accepted norms." Adverse human health effects include bodily impairment, infirmity, illness, or death. Adverse environmental effects may include ecological, cultural, human health, economic, or social impacts when interrelated to impacts on the natural or physical environment. The Proposed Action areas are not located adjacent to minority populations or low-Income population centers, and indirect impacts to such communities located in the surrounding areas were not identified during the analysis of the Proposed Action; therefore, the Proposed Action would not result in disproportionately high or adverse human health or environmental effects on minority or low-income populations.

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5.0 CONCLUSION

The AF proposes to install a LDS at nine sites (one on CCAFS, four on KSC and four in the surrounding areas of Brevard, Osceola, and Orange Counties). This action is being proposed to improve the AF's ability to detect and track lightning hazards. Only one alternative to the Proposed Action was identified, the No Action Alternative. The current LDS is nearing the end of its logistical lifespan, and has significant operational limitations. The data that could be received from the new LDS is required to support the evaluation of the Lightning Launch Commit Criteria as well as the issuance of timely and reliable warnings in support of routine ground operations.

No significant environmental impacts were identified that would require the completion of an Environmental Impact Statement. However, some less than significant and beneficial impacts were identified and are summarized below in Table 5-1, along with measures to minimize any impacts and applicable regulatory guidance.

Table 5-1: Environmental Assessment Summary Matrix

Resource Category	Potential/Known Impact(s)	Minimization Measure(s) and Applicable Guidance
Air Quality	Short term impacts to air quality from particulate matter, CO, SO ₂ and NO _x	Periodically water construction site and restrict vehicle speeds for dust control.
Biological Resources	Direct impacts to native plant communities, T&E animals, and SSC	Survey and identify T&E animals and SSC and native habitats prior to activities. Stake off all areas of avoidance. Mitigate losses of wetlands and scrub jay habitat by creating/restoring habitat.
Biological Resources	Impacts to Florida Scrub Jay	Survey areas prior to clearing to determine if there are any active scrub-jay nests located within the vegetation. If an active nest is located, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or the nest has failed. Prior to land-clearing, 1.12 acres of scrub habitat has to be restored onsite or plans to restore made available to USFWS. Preserve any dead Florida Scrub-jays and notify USFWS immediately.
Biological Resources	Impacts to Southeastern Beach Mouse	Preserve any dead Southeastern Beach Mice and notify USFWS immediately.
Biological Resources	Impacts to Eastern Indigo Snake	Develop an Eastern Indigo Snake Protection/Education Plan, and provide to USFWS for review. Only allow authorized individuals to come in contact with or relocate the Eastern Indigo Snake. Snakes only allowed in captivity long enough to transport them to a release site with no two snakes occupying the same container during transport. Submit an Eastern Indigo Snake monitoring report to USFWS within 60 days of clearing activities if any Eastern Indigo Snakes are observed or relocated.

Biological Resources	Potential disturbance of birds protected by the MBTA and ESA	Where possible, avoid work during nesting season in areas where nests are found. Relocate nests/eggs in accordance with the Federal Depredation Permit.
Biological Resources	Spread of invasive species	Follow Invasive Species Management Plan.
Cultural Resources	Degradation of unknown/undiscovered archeological resources	Cease project activities if human remains are unearthed and notify archeologist if artifacts are found.
Infrastructure and Transportation	Potential damage to underground utilities from heavy equipment	Obtain dig permit prior to ground disturbance.
Noise	Short-term noise impacts to workers and surrounding personnel	Use administrative or engineering controls and PPE where necessary.

6.0 DOCUMENTATION CITED

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Endangered Species Act, 1973. Pub. L. No.93-205, 81 Stat. 884 (Dec. 28, 1973) (current version at 16 USC. 1531-1543 (1982)).

Executive Order 11988, 1977. *Floodplain Management*.

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NASA, 2001. *Range Instrumentation Handbook for KSC*.

Soil Conservation Service, 1974. *Soil Survey of Brevard County, Florida*. November.

USAF, 2001. *Integrated Natural Resources Management Plan, Cape Canaveral Air Force Station, Florida*. U.S. Air Force, 45th Space Wing.

USEPA, 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, NJID, 300 1, December 31, 1971.

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Appendix A

AF Form 813

REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS		Report Control Symbol RCS: WON 10214252
INSTRUCTIONS: Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).		
SECTION I - PROPOONENT INFORMATION		
1. TO (Environmental Planning Function) 45 CES/CEV	2. FROM (Proponent organization and functional address symbol) SLRSC C/D	2a. TELEPHONE NO. 494-4627
3. TITLE OF PROPOSED ACTION Install Vaisala 4D Lightning Surveillance System		
4. PURPOSE AND NEED FOR ACTION (Identify decisions to be made and need date) The purpose of the project is to install a lightning surveillance system at nine sites. This system will replace the existing LDAR System and will support the SLRSC weather C/D system upgrades. The 4DLSS project is in (Cont. on page 2)		
5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES (DOPAA) (Provide sufficient details for evaluation of the total action.) A system of nine antennas will be installed at various locations; one on Cape Canaveral Air Force Station (CCAFS); four on Kennedy Space Center (KSC); and four on property located away from CCAFS and KSC. (Cont. on page 2)		
6. PROPOONENT APPROVAL (Name and Grade) Joe Pallay, Civilian	6a. SIGNATURE //Signed//	6b. DATE 2 Nov 04
SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. (Check appropriate box and describe potential environmental effects including cumulative effects.) (+ = positive effect; 0 = no effect; - = adverse effect; U = unknown effect)		
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE (Noise, accident potential, encroachment, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
8. AIR QUALITY (Emissions, attainment status, state implementation plan, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
9. WATER RESOURCES (Quality, quantity, source, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
10. SAFETY AND OCCUPATIONAL HEALTH (Asbestos/radiation/chemical exposure, explosives safety quantity-distance, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
11. HAZARDOUS MATERIALS/WASTE (Use/storage/generation, solid waste, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
12. BIOLOGICAL RESOURCES (Wetlands/floodplains, flora, fauna, etc.) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		
13. CULTURAL RESOURCES (Native American burial sites, archaeological, historical, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
14. GEOLOGY AND SOILS (Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
15. SOCIOECONOMIC (Employment/population projections, school and local fiscal impacts, etc.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
16. OTHER (Potential impacts not addressed above.) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION		
17. <input type="checkbox"/> PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) #, OR <input checked="" type="checkbox"/> PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.		
18. REMARKS P 23 Feb 05, RS 31/05		
See page 18.		
19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION (Name and Grade) E. ALEXANDER STOKES III, REM, GS-14 Chief, Environmental Flight	19a. SIGNATURE 	19b. DATE 1 May 05

AF FORM 813, AUG 93 (EF-V1) (M.S. Word 97 form)

THIS FORM CONSOLIDATES AF FORMS 813 AND 814.

PREVIOUS EDITIONS OF BOTH FORMS ARE OBSOLETE.

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4. Purpose and Need for Action (cont.)

response to 45th Space Wing Requirement Statement # 9713401. This requires the deployment of a system to display real-time all lightning flashes within a 60 nmi radius of CCAFS and individual lightning source locations within 20 nmi of CCAFS shall be accurate to within 500 m while the full volumetric extent of the flash shall be accurate to within 1 km. It further requires the lightning flash detection efficiency within 20 nmi of CCAFS shall be >99% and >95% within 60 nmi of CCAFS.

Aside from the current thirteen-year-old NASA designed and installed LDAR system (which is near the end of its logistical lifespan), existing 45 SW lightning surveillance systems have significant operational limitations. While the Launch Protection Lightning Warning System (LPLWS) has limited lightning detection capability (that is, LPLWS is capable of detecting both in-cloud and cloud-to-ground lightning) its effective range is limited to approximately 20 nmi. The Cloud-to-Ground Lightning Surveillance System (CGLSS) and the National Lightning Detection Network (NLDN) have much larger effective ranges but only detect cloud-to-ground lightning. The LPLWS, CGLSS, and NLDN cannot depict the full volumetric extent of the lightning. Thus, a 4D lightning surveillance system such as LDAR is required to provide the 45SW with a comprehensive real-time view of all lightning in the launch and operations area.

5. Description of Proposed Action and Alternatives (cont.)

The four locations offsite are 1) Satellite Boulevard in Brevard County, 2) Deseret Ranch in Osceola County, 3) Ward Ranch in Orange County, and 4) Seminole Ranch in Brevard County. The antenna is typically mounted to a concrete base that is 36" square, 36" below grade and 12" above grade. The guy wires are made out of Kevlar and extend 20' out from the center of the antenna. The typical antenna site will have power and communications hardwired. Each antenna will have two junction boxes that are 20" X 13.5" X 8". One will house the antenna electronics package and the other will house the UPS battery system. There will also be two junction boxes that are 6" X 6" X 4"; one will be the communications interface and the other will be a power interface. These junction boxes will be installed approximately 4' above grade. Each site will also have a grounding rod system installed for protection of the antenna electronics. The antenna itself is a fiberglass structure, with a 6.25" diameter. The attached illustration shows the set up of a typical antenna. The following describes the particular scope of work at each site.

Site 1 – Observation Road
Cape Canaveral Air Force Station

The antenna will be 25' high on a concrete base 3' X 3' with four 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system.

Site 2 – Satellite Boulevard
Brevard County

The antenna will be 30' high on a concrete base 3' X 3' with eight 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system. A small number of trees will require removal. This site is located in both the 100-year floodplain, as well as wetlands. The property is owned by the St. John's River Water Management District (SJRWMD), who selected the site for this sensor.

Site 3 – Deseret Ranch
Osceola County

The antenna will be 25' high on a concrete base 3' X 3' with four 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will

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be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system. This site is located in the middle of a cow pasture, which is also in the 100-year floodplain. The property is privately owned.

Site 4 – Ward Ranch
Orange County

The antenna will be 25' high on a concrete base 3' X 3' with four 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system. A small number of trees will require removal.

Site 5 – Seminole Ranch
Brevard County

The antenna will be 25' high on a concrete base 3' X 3' with four 20' guy wires. The cement base at this site will be approximately 36" above grade. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. Some amount of vegetation may require removal. See attached site plan for exact location and layout of the proposed system. This site is located in both the 100-year floodplain, as well as a wetland. The property is owned by the SJRWMD.

Site 6 – Shiloh
Kennedy Space Center

The antenna will be 30' high on a concrete base 3' X 3' with eight 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system. Several trees adjacent to the system will require removal.

Site 7 – Universal Camera Site 13
Kennedy Space Center

The antenna will be 25' high on a concrete base 3' X 3' with four 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system. There will be a ramp from the top of the camera pad to the antenna.

Site 8 – J8-1567 Beach
Kennedy Space Center

The antenna will be 25' high on a concrete base 3' X 3' with four 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system. Some vegetation may require removal.

Site 9 – Orange Grove
Kennedy Space Center

The antenna will be 30' high on a concrete base 3' X 3' with eight 20' guy wires. To accommodate the tower and guy wires, a 50' X 50' cleared area will be required. A fence will be installed around the antenna and guy wires and there will be a 30' cleared area around the outside of the fence. The areas inside and outside the fence will be kept mowed. See attached site plan for exact location and layout of the proposed system. Some trees will require removal.

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ALTERNATIVES

No Action

The current lightning detection system is 13 years old and is nearing its logistical lifespan. Additionally, the existing system has significant operational limitations. The data received from the new lightning detection system is required to support the evaluation of the lightning launch commit criteria as well as the issuance of timely and reliable warnings in support of routine ground operations. Due to these reasons, the no action alternative is not preferred.

Install Lightning Detection System at Alternate Locations

The company that makes the system, Vaisala Inc., considered the topography of the area surrounding CCAFS/KSC and proposed that the system consist of eight remote sensor locations to meet the system performance requirements. Sites were proposed based upon known locations of existing Eastern Range weather instrumentation. Vaisala ran their system performance routine and determined that an additional location was required to fill in a gap in the system performance routine; therefore, the system would consist of nine sensors. The following describes criteria that were used to determine optimal locations.

- Vaisala indicated that the location of the sensors was strictly dependent on noise, which is related to the amount and type of traffic (cars are less of a problem than 2-cycle motor-scooters). They indicated that high-traffic roads should be 100-200 meters away.
- For high voltage lines, it was determined that if a distribution power line is "clean" (all the bolts are tight and the insulators are clean and good), the sensor can be as close as 20 meters. Really bad power lines can affect the sensor at 1-2 km away.
- Vaisala indicated that for vegetation, the surrounding vegetation should not exceed 10 feet and they recommended a distance of 2-3 times the height of the tree. Because the LDAR II sensor detects VHF signals, the path between the antenna and distant lightning must be line-of-sight to avoid loss of desired signals. Trees or vegetation that block more than 5 degrees of horizontal view may be considered an obstruction.

Vaisala provided optimal coordinates for the sensors and during field reconnaissance surveys, a few of the locations had to be changed for various reasons. For example, one location ended up being in the middle of a river. Once everything was considered, the above sites were selected and RF surveys were conducted to ensure optimal performance of the system as a whole. The system is composed of nine (9) sensor locations and moving any one of them (more than perhaps 100 feet) could degrade the overall performance of the system and not achieve the 99% detection capability requirement. Moving any sensor location more than 100 feet will require the manufacturer to perform a new RF survey.

18. Remarks

Site 1 – Observation Road Cape Canaveral Air Force Station

The proposed site in which this tower will be placed is located in land management unit 88, which was cut and burn in 2002 and is relatively good Florida Scrub-jay habitat. The vegetation is 3-5' tall with interspersed openings, although the area in which the antenna will be placed does not have as many openings as the remainder of the compartment. The project manager offered to move the site to prevent impacts to jays; however, the antenna cannot be moved more than 100' in any direction and the CEVP believes this is the best site in the immediate area. Although a small amount of habitat will be permanently lost, it is not expected to have an adverse impact to the species. One of the requirements for the antenna is to have surrounding vegetation at a height no greater than 5'. This requirement will ensure the vegetation in this area is kept at optimal scrub-jay height. Additionally, the 30' cleared area outside the fence will create additional caching area for the jays.

Three federally protected species, the Florida Scrub-jay (*Aphelocoma coerulescens*), Southeastern Beach Mouse (*Peromyscus polionotus niveiventralis*), and the Eastern Indigo Snake (*Drymarchon corais couperi*) are known to utilize either the project area or adjacent areas. Due to the presence of these species, consultation with the U. S. Fish and Wildlife Service (USFWS) was required. A Biological Opinion (BO) was issued 12/15/05.

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WON 10214252

If any jays are found to be nesting in or near the project area, clearing will not be authorized during the scrub-jay nesting season. The project manager will be advised to clear the area prior to the beginning of the nesting season to ensure the project does not get held up due to nesting jays. Additionally, in accordance with the CCAFS scrub habitat compensation program, compensation for the loss of 0.28 acres of scrub habitat will be required at a ratio of 4:1, thereby requiring 1.12 acres of compensation. Since this is a 45SW project, the required compensation acreage will be taken care of through the current Air Force scrub restoration program.

Four small mammal burrows have been observed at the site and, although not confirmed, it is possible that these are southeastern beach mice burrows. Beach mice have been observed in areas away from the coast on CCAFS and although these burrows are not located in typical beach mouse habitat, in accordance with the Biological Opinion issued by USFWS in August 2002, the AF is required to consult on projects that involve a permanent removal of habitat. These burrows would be destroyed during clearing activities. The USFWS issued a take for any beach mice located in this project area.

There were no indigo snakes observed during the site visit; however, it is possible that indigos utilize the area. The project manager and construction personnel will be advised of the possible presence of indigos. An educational sign will be displayed at the site, informing personnel on the snake's appearance, protected status, and whom to contact if any are spotted in the area. Any indigo snakes encountered during clearing activities will be allowed to safely leave the area on their own. Furthermore, any indigos encountered during gopher tortoise burrow excavation will be safely moved out of the project area. Per the USFWS BO, an eastern indigo snake protection/education plan will be developed for all construction personnel to follow.

The project area is known to support gopher tortoises, a state listed species of special concern. All tortoises/burrows located in the project areas that have the potential to be impacted by project activities must be relocated in accordance with permit requirements. The 45 CES/CEVP office must be contacted (853-6822) at least three weeks prior to start of project so that tortoise relocation can be scheduled.

Site 2 – Satellite Boulevard
Brevard County

The proposed site for this sensor is located in a freshwater emergent wetland, as identified by the National Wetlands Inventory. The site is located in the center of an open area adjacent to a dirt road that runs alongside the property. The area surrounding it consists of cabbage palms, brazilian pepper and various grass species (see attached photo). Cows have access to the site and it apparent that they graze in this area quite often.

Installation of this tower may require a Dredge and Fill Permit from the U.S. Army Corps of Engineers and permitting through Florida Department of Environmental Protection (FDEP). Additionally, coordination and/or permitting actions with the St. John's River Water Management District may be required. This must be coordinated through the Environmental Support Contract (ESC) office at 853-6536.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, this site is located within the 100-year floodplain.

Since this site is located in a wetland, as well as the 100-year floodplain, a Finding of No Practicable Alternative (FONPA) will be required to discuss why no other practicable alternative exists to constructing in a wetland/floodplain. The FONPA will require approval from the MAJCOM before work may begin at these two sites. The 45 CES/CEVP office will be responsible for completing and submitting the FONPA for approval.

A lease with the property owner will be required to use the subject property; therefore, an Environmental Baseline Survey (EBS) or Waiver will be required, in accordance with AFI 32-7066, *Environmental Baseline Surveys in Real Property Transactions*.

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lightning detection equipment located at this location.

According to the FEMA Flood Insurance Rate Map, this site is located within the 100-year floodplain; therefore, a FONPA will be required to discuss why no other practicable alternative exists to constructing in a floodplain. The FONPA will require approval from the MAJCOM before work may begin at these two sites. The 45 CES/CEVP office will be responsible for completing and submitting the FONPA for approval.

A lease with the property owner will be required to use the subject property; therefore, an Environmental Baseline Survey (EBS) or Waiver will be required, in accordance with AFI 32-7066, *Environmental Baseline Surveys in Real Property Transactions*.

**Site 4 – Ward Ranch
Orange County**

This site is located in a cow pasture on private property. There are a few trees located-nearby that will require removal and the property owner has already given permission to do this. There are no environmental issues associated with the location; however, a lease with the property owner will be required to use the subject property. An Environmental Baseline Survey (EBS) or Waiver will be required, in accordance with AFI 32-7066, *Environmental Baseline Surveys in Real Property Transactions*.

**Site 5 – Seminole Ranch
Brevard County**

The proposed site for this sensor is located in a freshwater emergent wetland, as identified by the National Wetlands Inventory. The area in which the sensor will be placed has been previously disturbed (see attached photo). The area contains several cabbage palms and a variety of grass species.

Installation of this tower may require a Dredge and Fill Permit from the U.S. Army Corps of Engineers and permitting through FDEP. Additionally, coordination and/or permitting actions with the St. John's River Water Management District may be required. This must be coordinated through the Environmental Support Contract (ESC) office at 853-6536.

According to the FEMA Flood Insurance Rate Map, this site is located within the 100-year floodplain.

Since this site is located in a wetland, as well as the 100-year floodplain, a FONPA will be required to discuss why no other practicable alternative exists to constructing in a wetland/floodplain. The FONPA will require approval from the MAJCOM before work may begin at these two sites. The 45 CES/CEVP office will be responsible for completing and submitting the FONPA for approval.

A lease with the property owner will be required to use the subject property; therefore, an Environmental Baseline Survey (EBS) or Waiver will be required, in accordance with AFI 32-7066, *Environmental Baseline Surveys in Real Property Transactions*.

**Site 6 – Shiloh
Kennedy Space Center**

Since this site is located on KSC, the NASA environmental office is required to provide environmental remarks associated with the project. The site is located in an area that has been previously disturbed. The attached Record of Consideration applies and must be adhered to.

**Site 7 – Universal Camera Site 13
Kennedy Space Center**

Since this site is located on KSC, the NASA environmental office is required to provide environmental remarks associated with the project. This site is located on improved grounds adjacent to an existing camera site. The attached Record of Consideration applies and must be adhered to.

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WON 10214252

Site 7 – Universal Camera Site 13
Kennedy Space Center

Since this site is located on KSC, the NASA environmental office is required to provide environmental remarks associated with the project. This site is located on improved grounds adjacent to an existing camera site. The attached Record of Consideration applies and must be adhered to.

Site 8 – SLC 39A Area
Kennedy Space Center

Since this site is located on KSC, the NASA environmental office is required to provide environmental remarks associated with the project. The area is located in coastal strand habitat adjacent to an active camera pad. The attached Record of Consideration applies and must be adhered to.

Site 9 – Orange Grove
Kennedy Space Center

Since this site is located on KSC, the NASA environmental office is required to provide environmental remarks associated with the project. The site is located in the middle of an old orange grove. The attached Record of Consideration applies and must be adhered to.

General Remarks

Prior to any digging, an Excavation Permit will be required. To obtain an excavation permit, contact SGS Mission Support, Excavation Administrator, at 861-4453. Additionally, an Air Force Form 103, BCE Work Clearance Request, will be required. Contact the Cape Superintendent for guidance on the use of AF Form 103.

These sites are located in areas that are in attainment for all criteria air pollutants; therefore, a conformity determination is not required.

Remarks on this AF Form 813 apply only to the proposed actions as described, and not to additional work that may be required. Any change in scope of the project will require re-evaluation by the 45 CES/CEVP at 853-6822. Additionally, if the project is not initiated within one year of this environmental analysis, it will require re-evaluation.

The proposed project has the potential to adversely impact CCAFS environmental attributes and does not qualify for a Categorical Exclusion (CATEX), as defined in 32 CFR 989, Appendix B. Therefore, further environmental analysis is required (e.g., Environmental Assessment or Environmental Impact Statement).

alc
18-Dec-05

PAGE 7 OF 7 PAGE(S)

Avoid Verbal Orders

TO: TA-C3/Environmental Coordinator
FROM: TA-C3/Lead, NEPA Compliance
SUBJECT: KSC Record of Environmental Consideration (REC)

DATE: 11/2/2004

1. PROJECT INFORMATION

Project Title: 4D Lightning Surveillance System
Project Lead: Joseph P. Pallay, SLRSC C&D Weather, 494-462 Directorate Project No.: 10187206 / TBD 04-043
EPO Reviewer: FFK Environmental (ENV) No.: N/A

2. NEPA DETERMINATIONS

- a. Categorical Exclusion per 14 CFR Part 1216.305(d)
- b. Environmental Assessment (EA) Required per KHB 8800.6
- c. Environmental Impact Statement (EIS) Required per KHB 8800.6
- d. Project on CCAFS:

3. ENVIRONMENTAL REQUIREMENTS

a. Non-Permit Requirements	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
b. Permit Requirements	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

THIS RECORD OF ENVIRONMENTAL CONSIDERATION (REC) ONLY APPLIES TO SENSOR SITES #6 (SHILOH), #7 (H4-1725), #8 (EAST OF PAD B / WEST OF THE BEACH), AND #9 (ORANGE GROVES SOUTH OF JEROME ROAD BURROW PIT).

3.a.1. THREATENED AND ENDANGERED SPECIES: An Biological Survey and/or relocation activities (if required) must be performed prior to commencement of this project. This project has the potential to impact several protected and/or threatened and endangered species - the Southeastern Indigo snake, Beach mouse and the Gopher Tortoise. Measures must be taken to minimize impacts to the habitat. If any indications of activity by any protected species are present (burrows) in the projected area of this project, the burrows must be identified and avoided. Upon request, the Shaffer, NASA Environmental Program Office will schedule a biological survey / relocation activities. Please contact John days (2 weeks) prior to any work.

3.b.1. EXCAVATION PERMIT: A KSC Excavation Permit will be required if any digging is proposed by this project. Please contact Mission Support at 861-4453 for an underground utility scan.

No other environmental issues were identified based upon the information provided in the KSC Checklist. This Record of Environmental Consideration (REC) does not relinquish the project lead from obtaining and complying with any other internal NASA permits or directives necessary to ensure all organizations potentially impacted by this project are notified and concur with the proposed project.

Due to potential changes in regulations, permit requirements and environmental conditions, statements in this REC are valid for 6 months, and subject to review after this period. The Environmental Program Branch (EPB) will be reviewing open projects twice a year for possible impacts from changes in contaminated sites. If impacts are foreseen, EPB will notify the project lead with a new REC. It is the responsibility of the project lead to notify EPB if the scope of the project including the design) has changed since the original checklist was submitted.

C: Joseph Pallay/SLRSC C&D Weather
John Shaffer/TA-C3
Mark Mercadante/CHS-022

Upon evaluation of the subject project, the above determinations have been made and identified. Contact the Environmental Program Office (TA-C3) at 867-8456 for re-evaluation should there be any modifications to the scope of work.

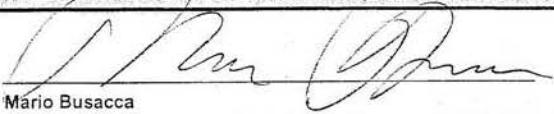
Avoid Verbal Orders

TO: TA-C3/Environmental Coordinator

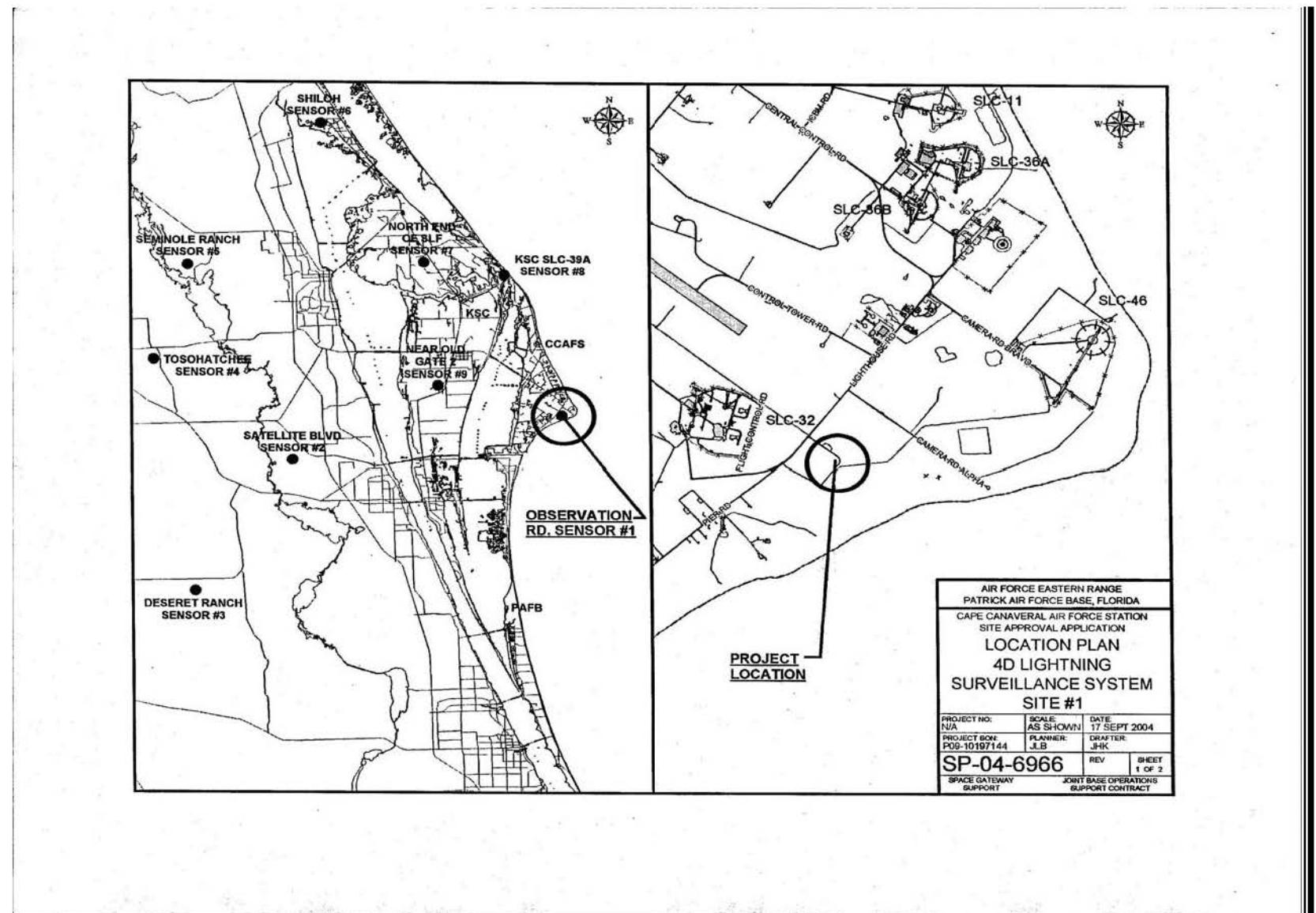
DATE: 11/2/2004

FROM: TA-C3/Lead, NEPA Compliance

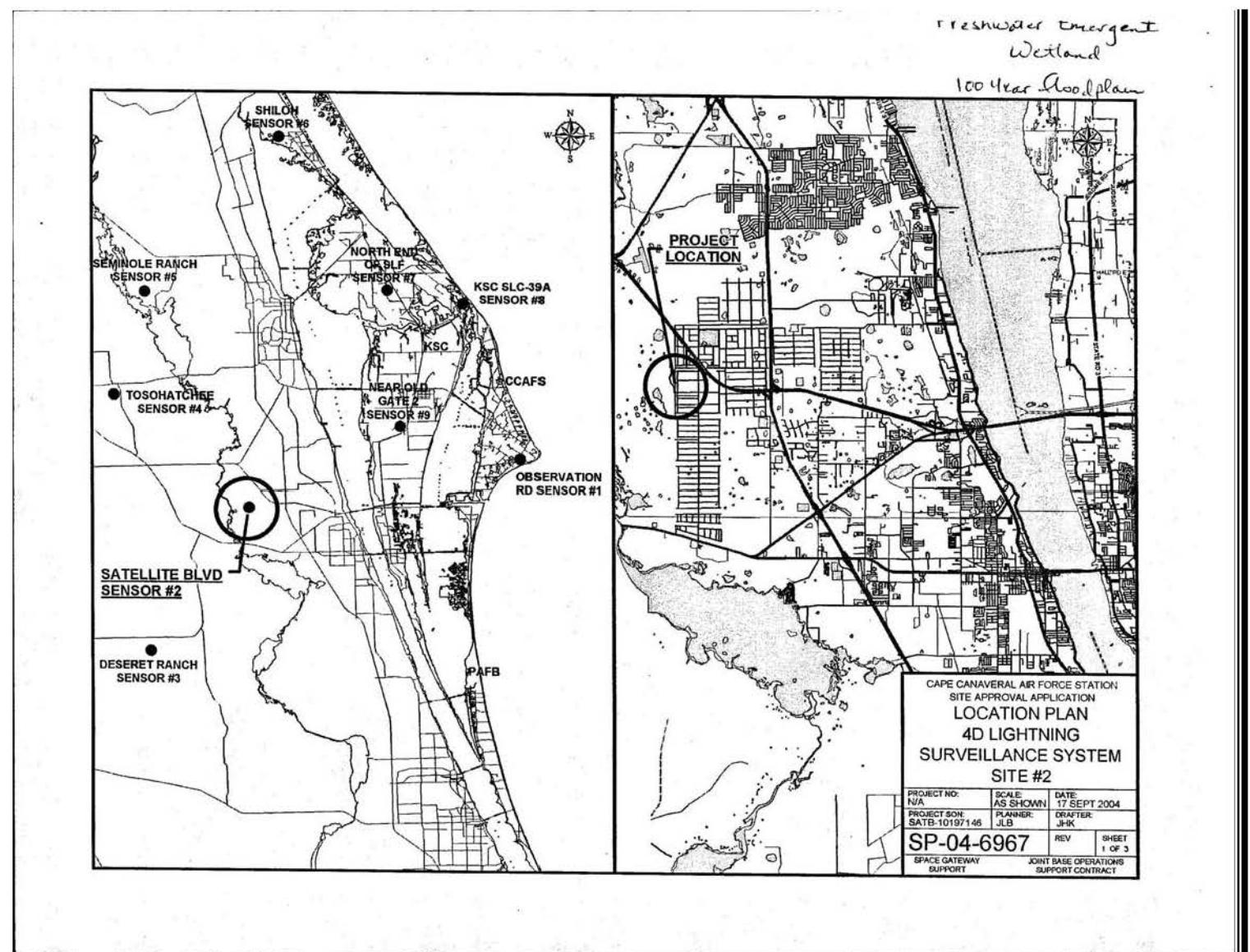
SUBJECT: KSC Record of Environmental Consideration (REC)

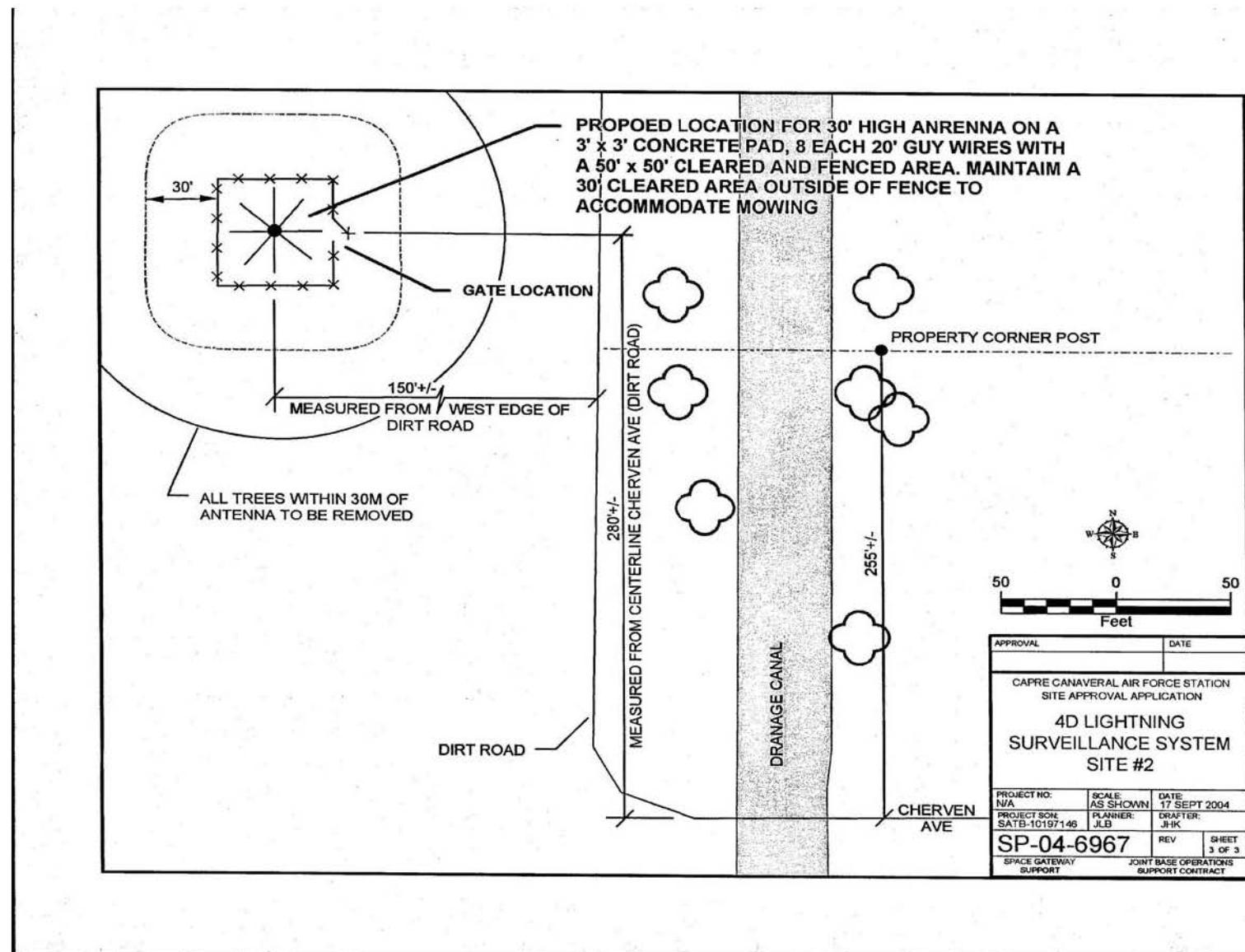

Mario Busacca


11/5/04
Date

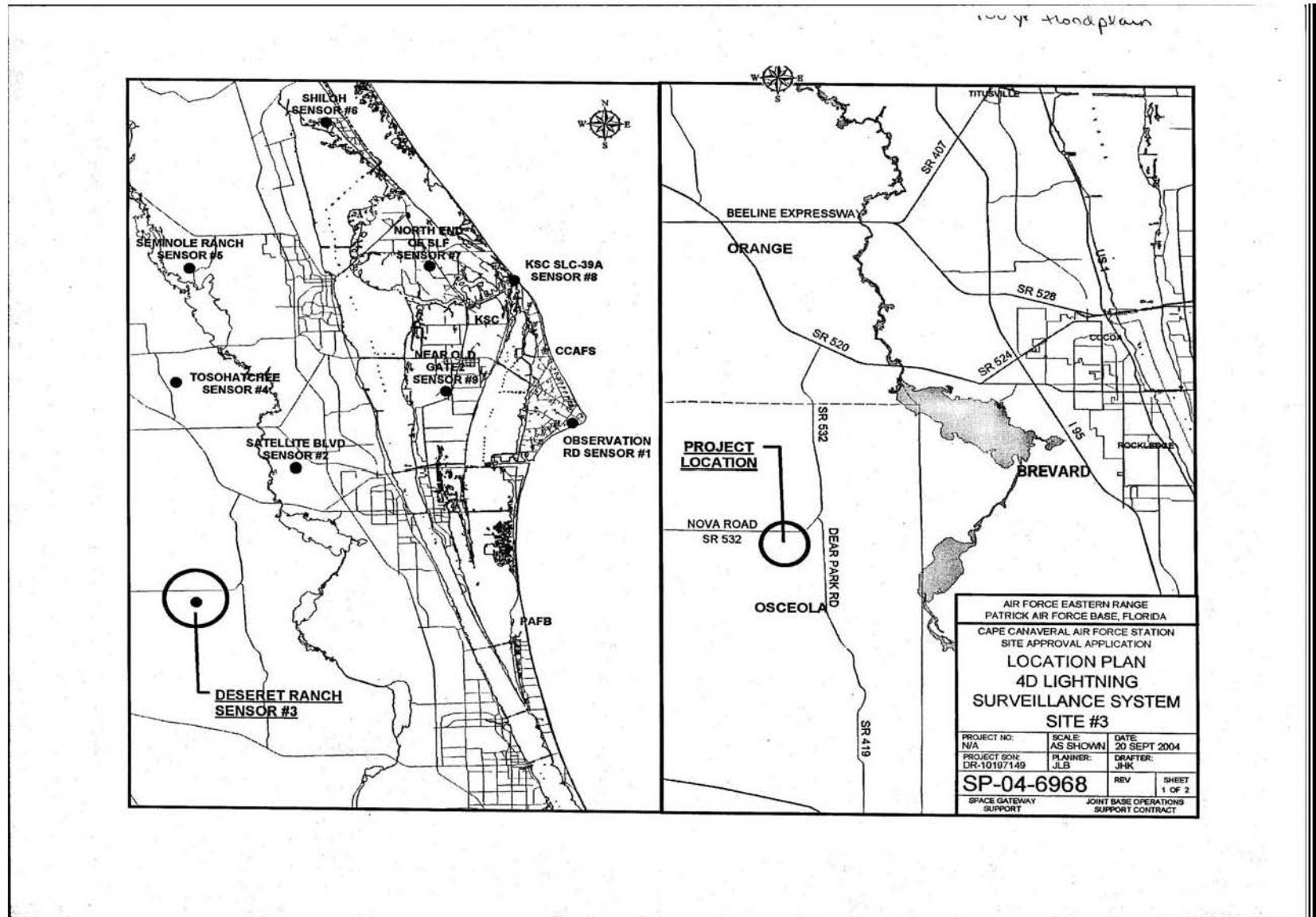




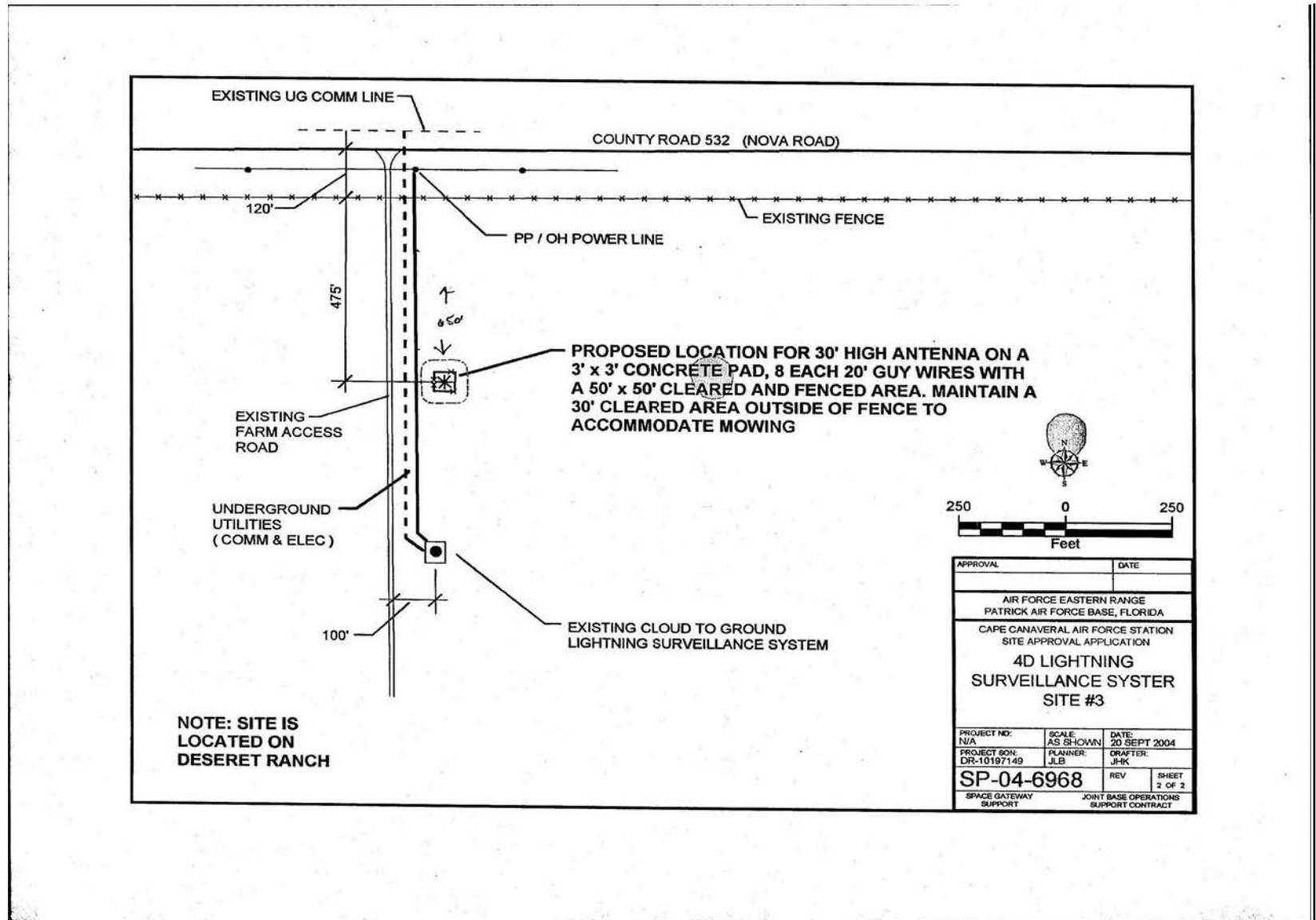


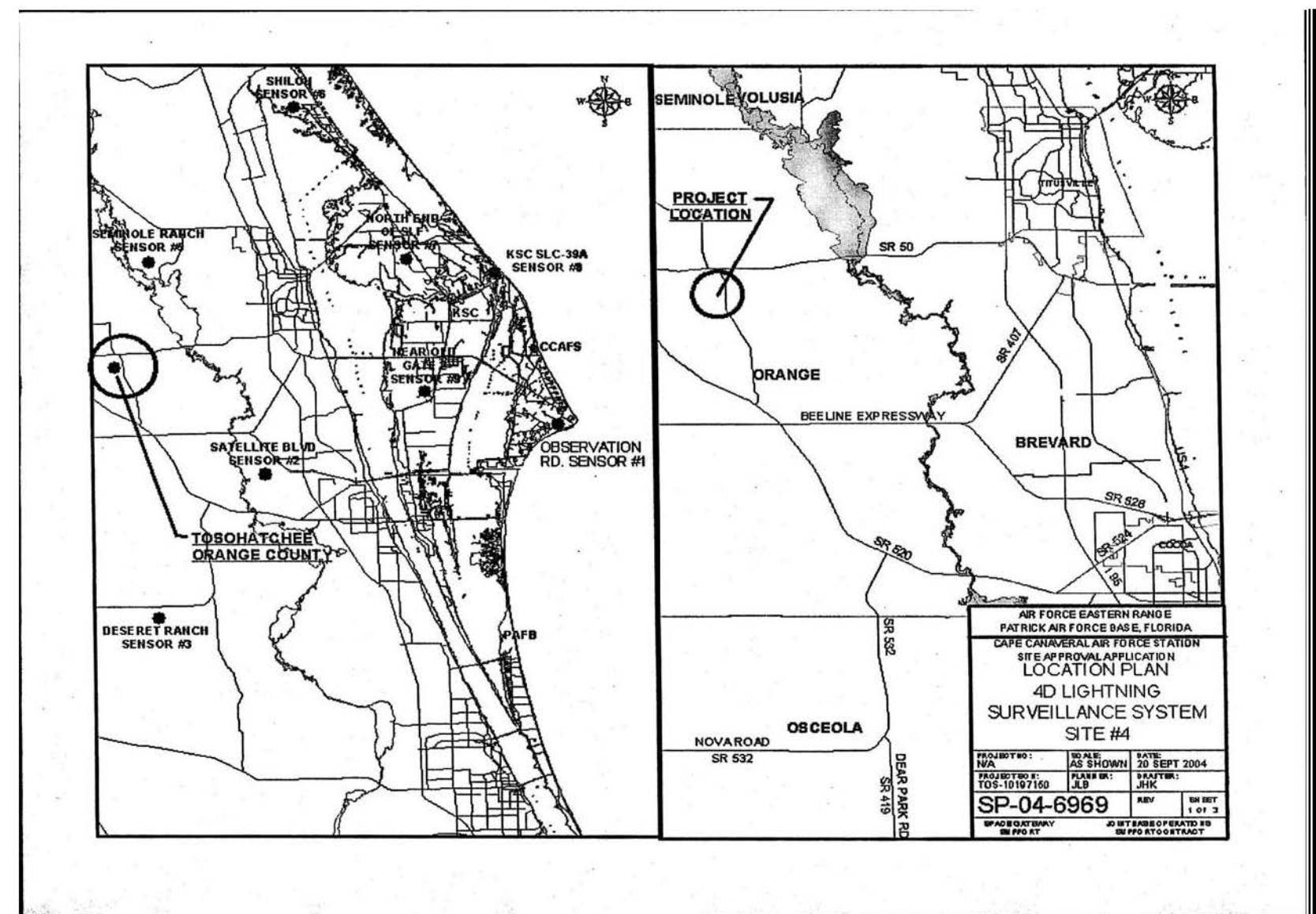


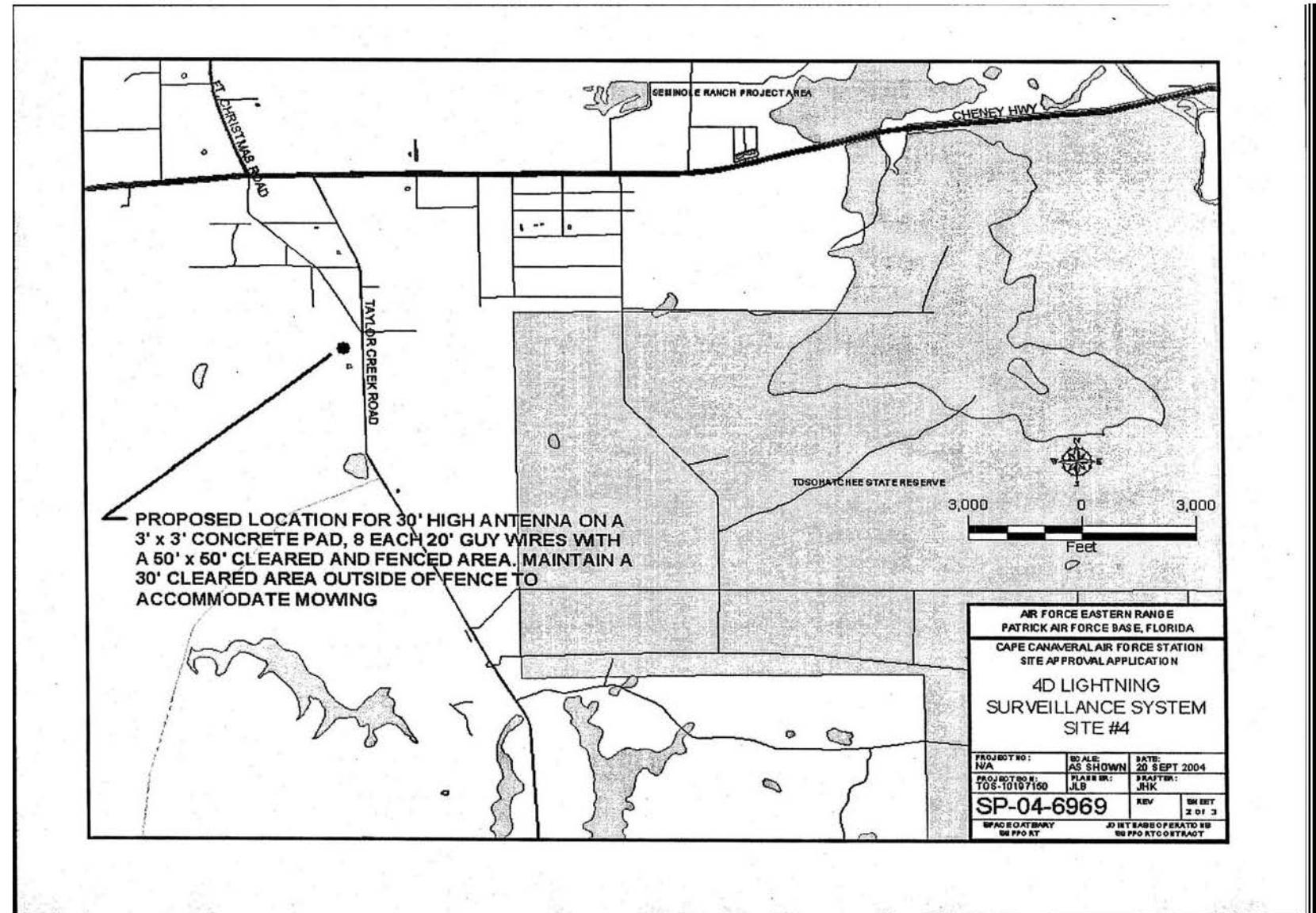


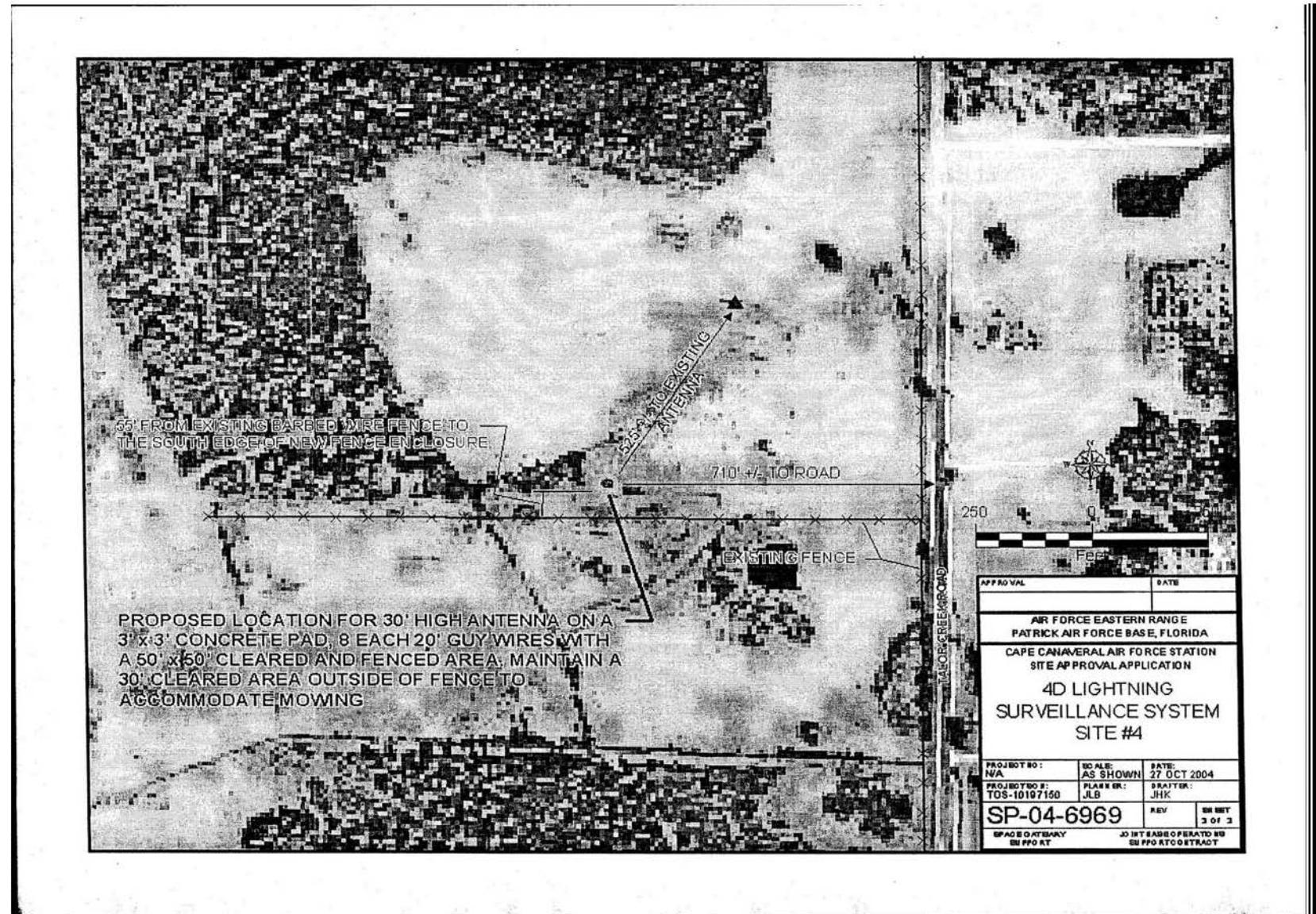


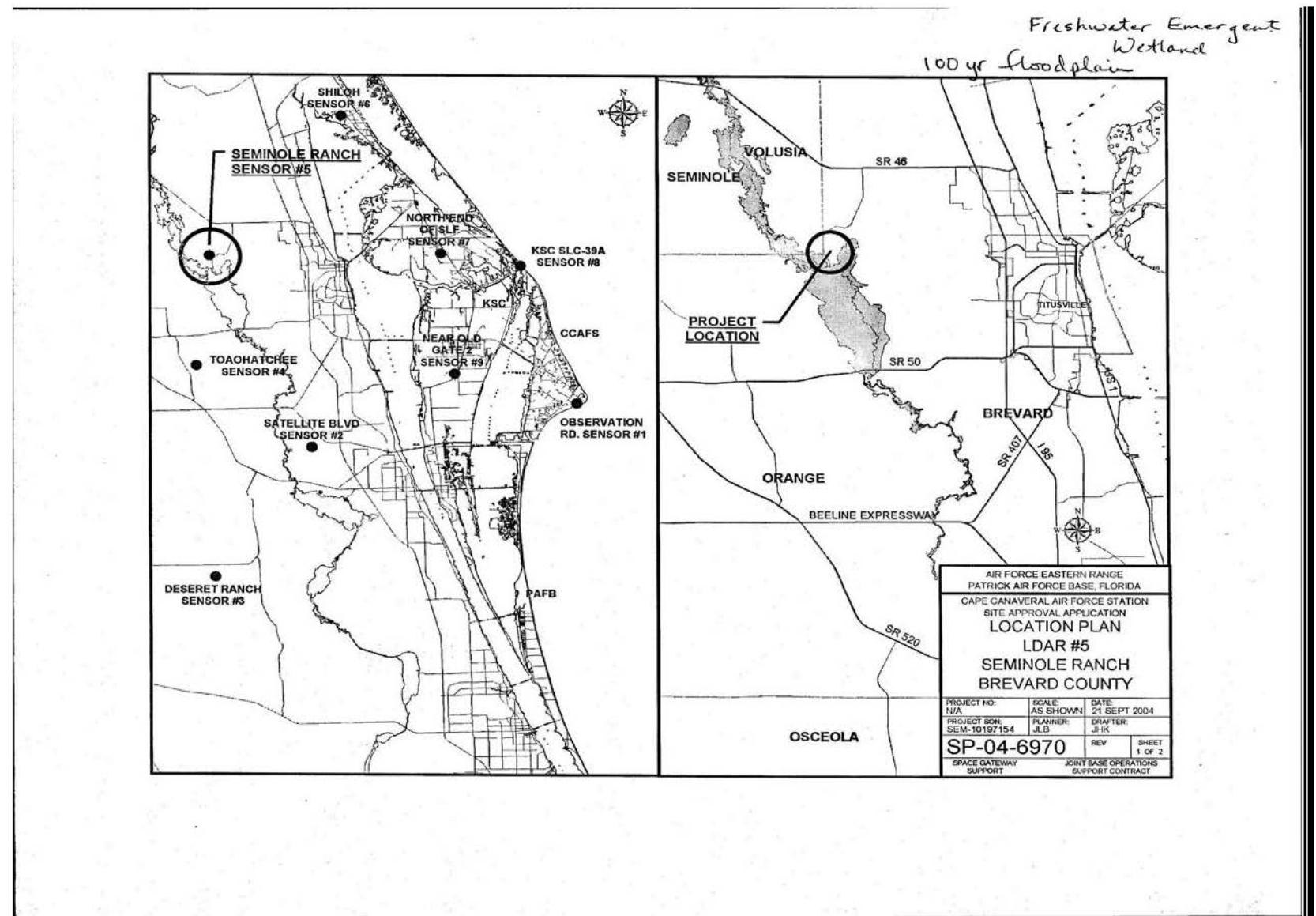
**Environmental Assessment for the
Installation of the Vaisala 4D
Lightning Detection System in the
Brevard, Osceola, and Orange Counties
Northeastern Florida**

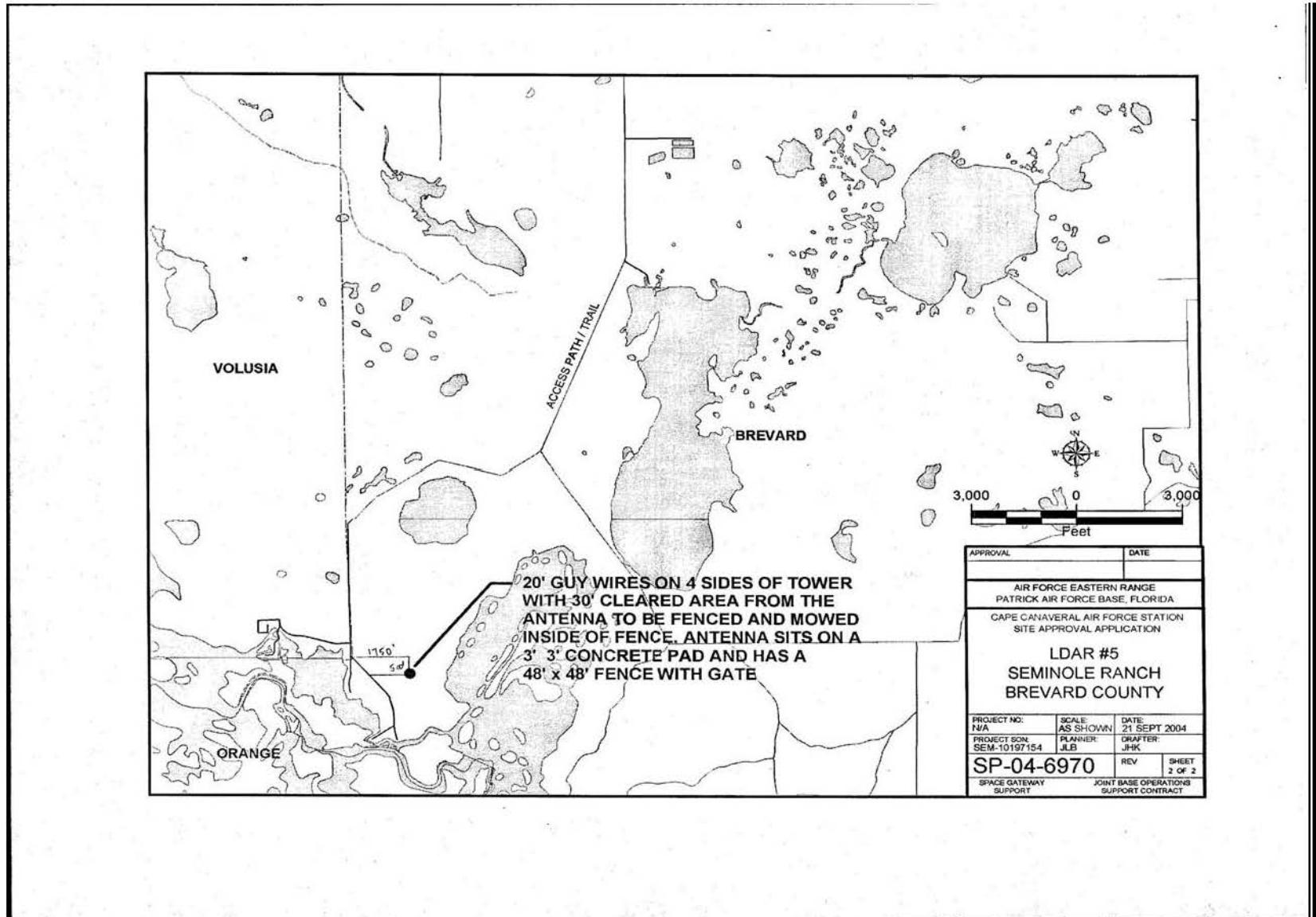


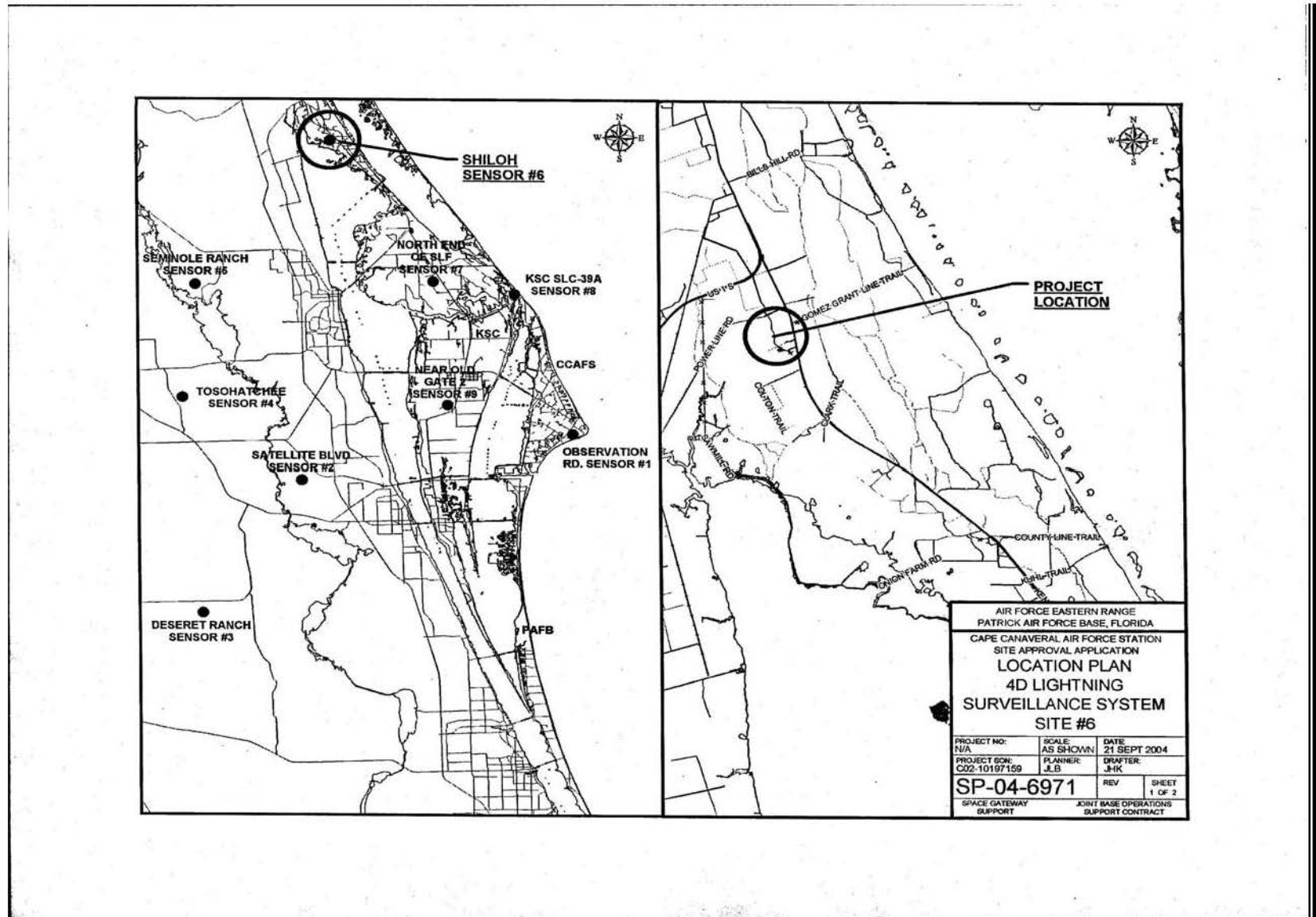


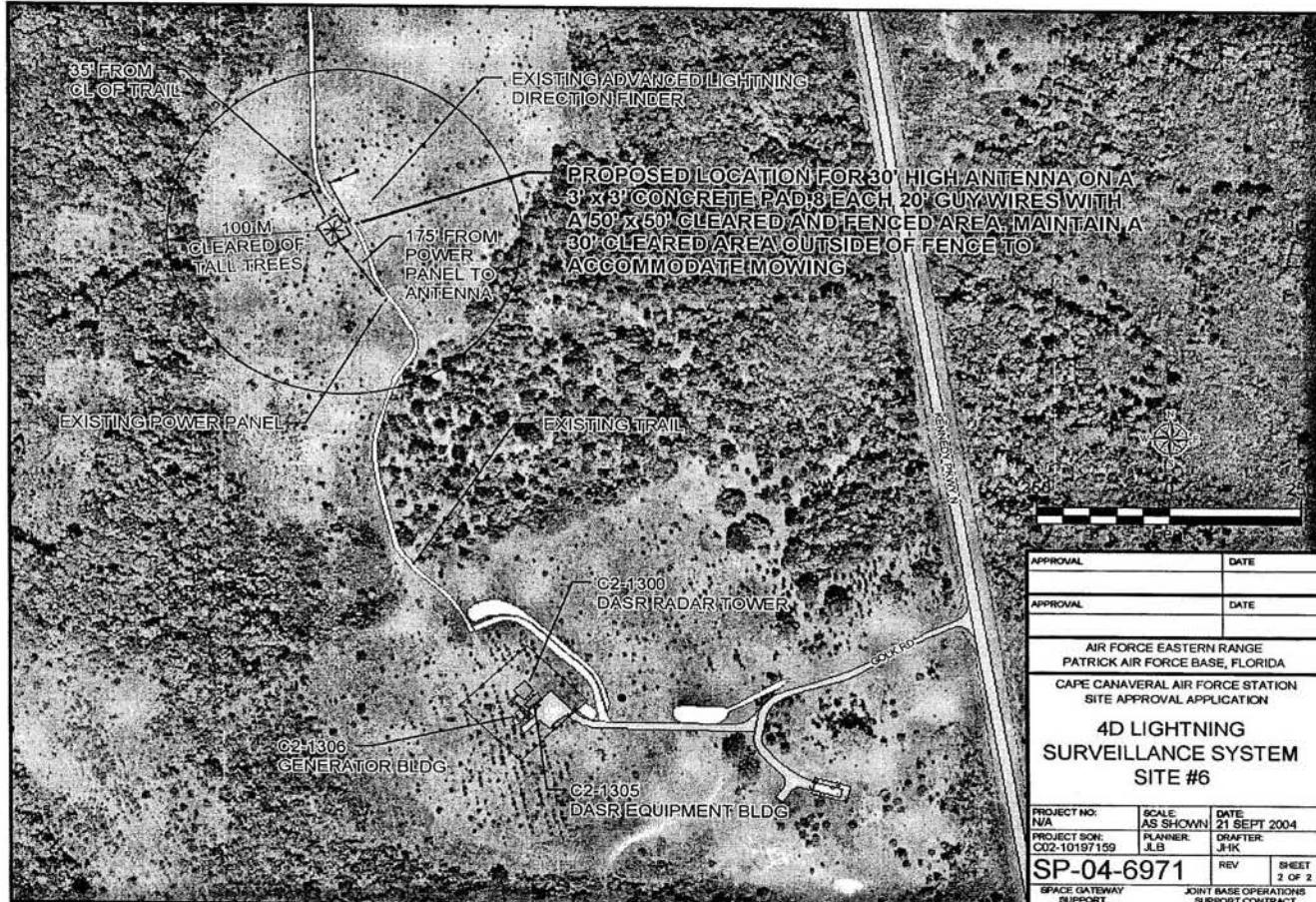


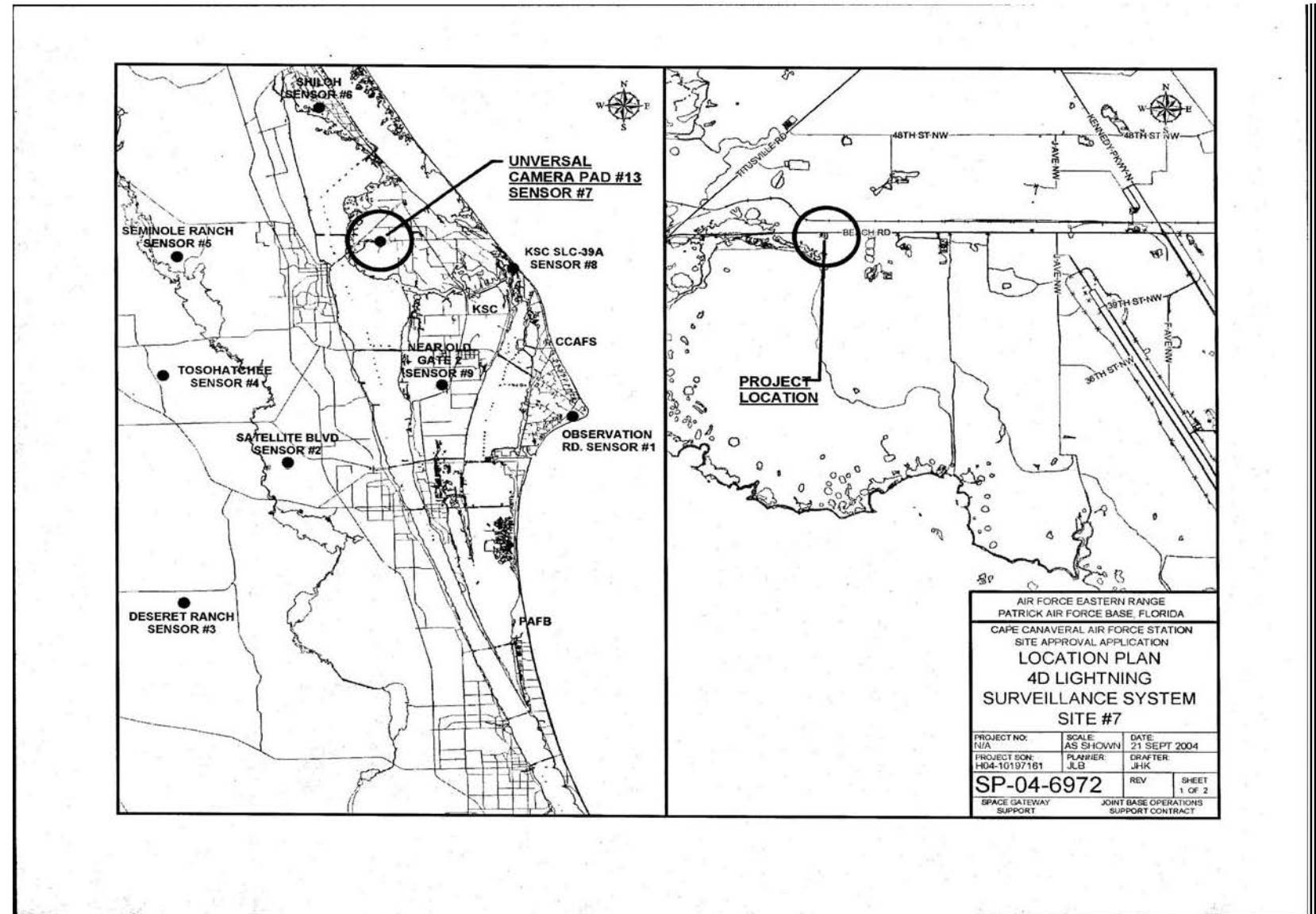


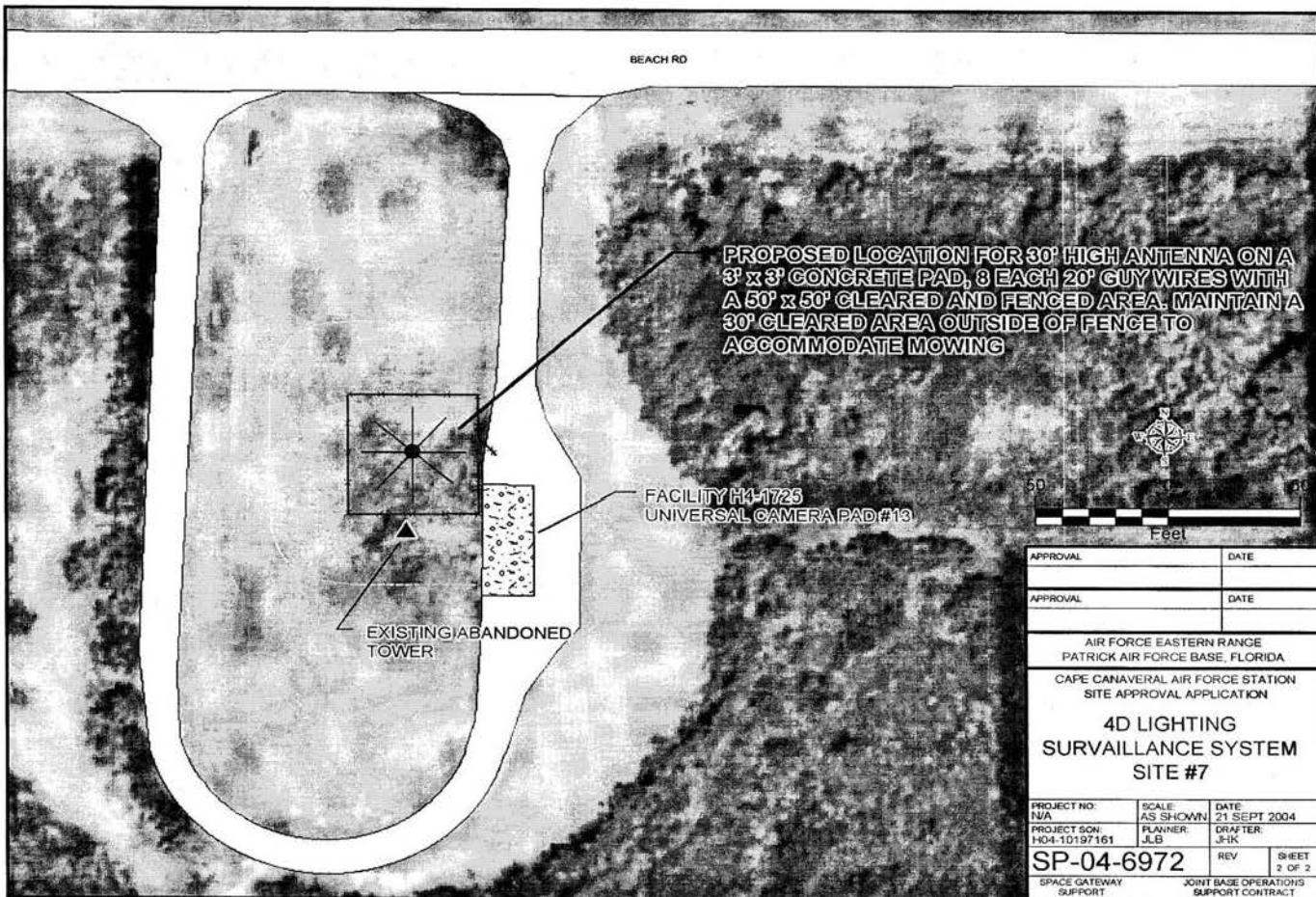


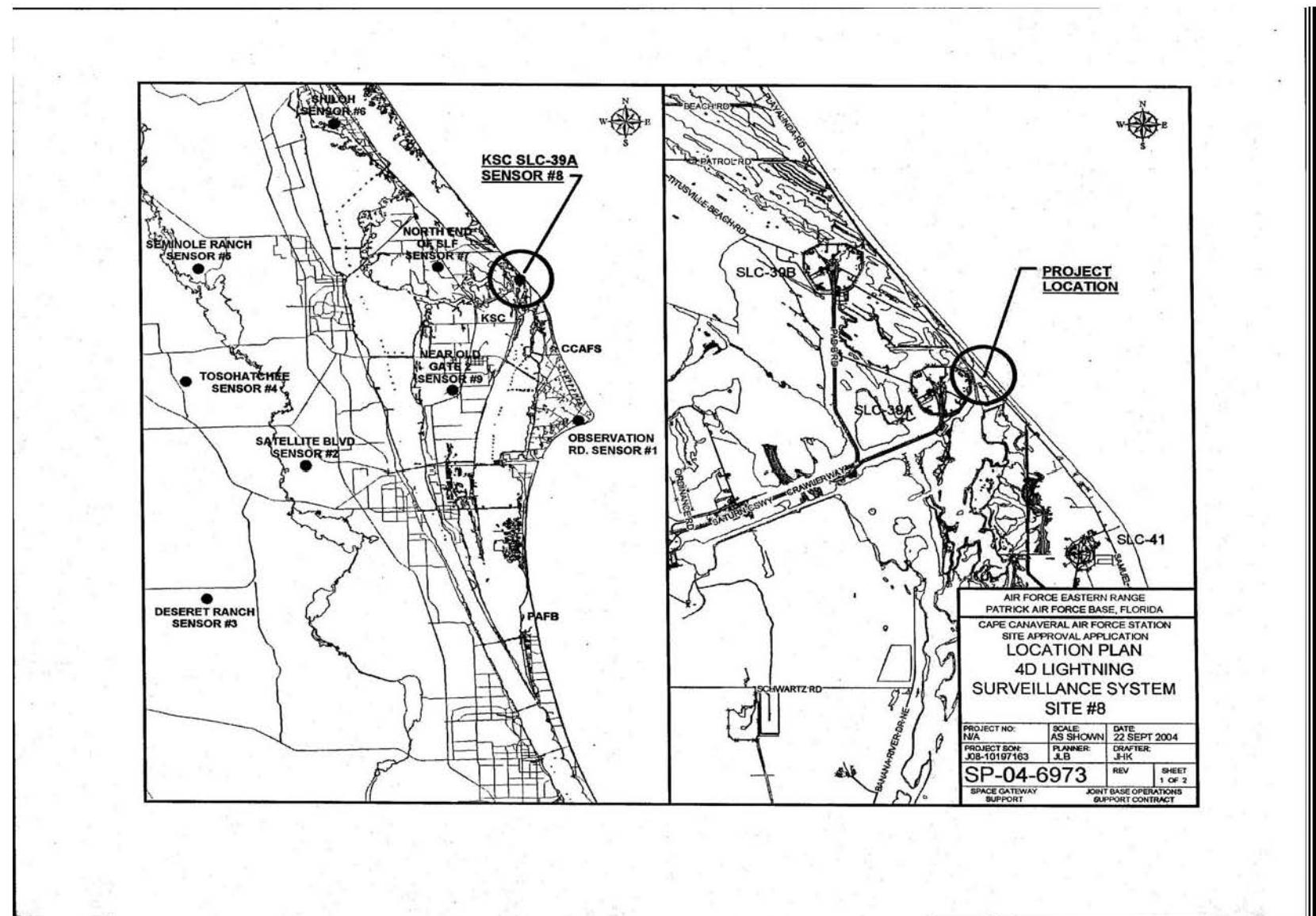


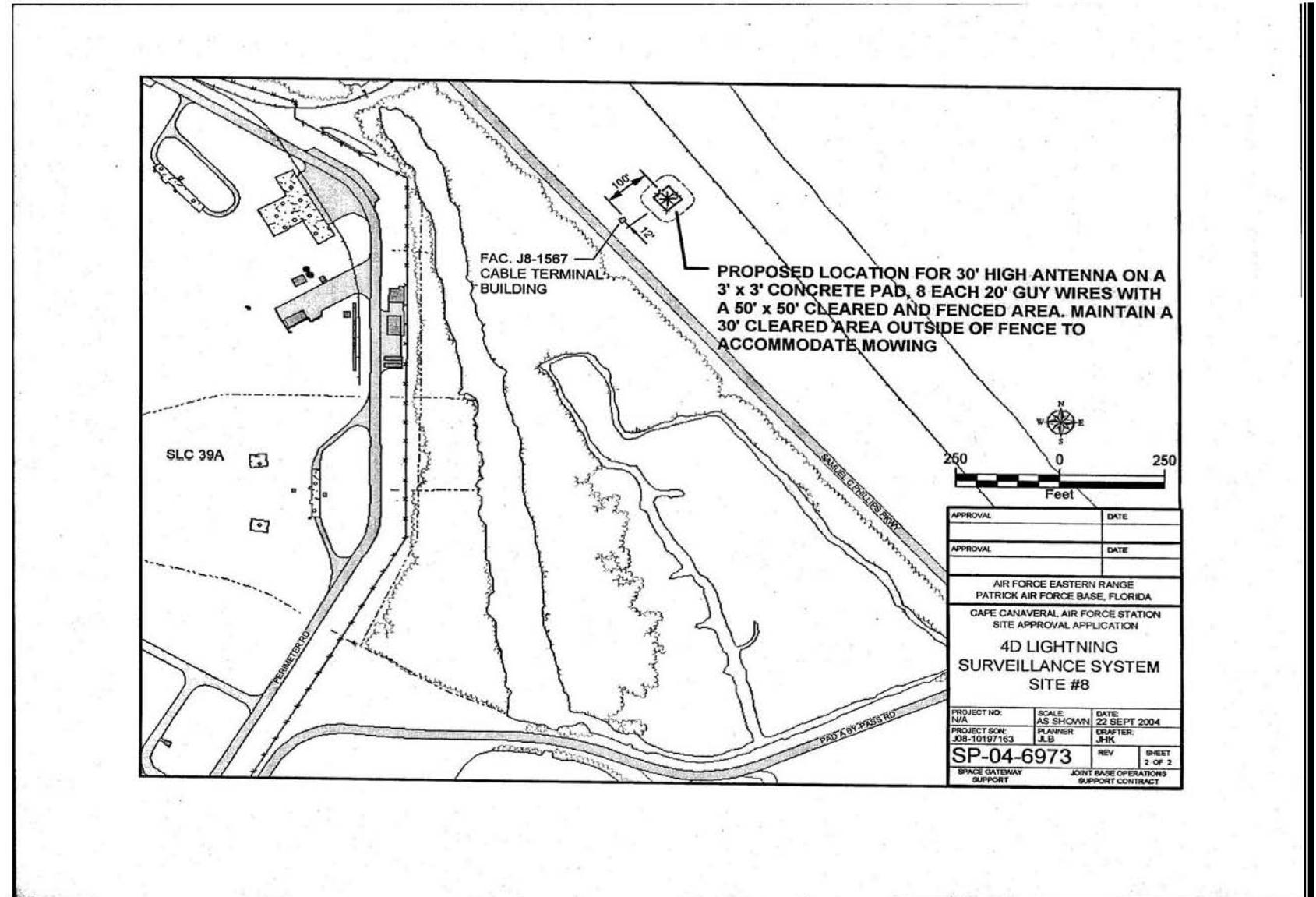


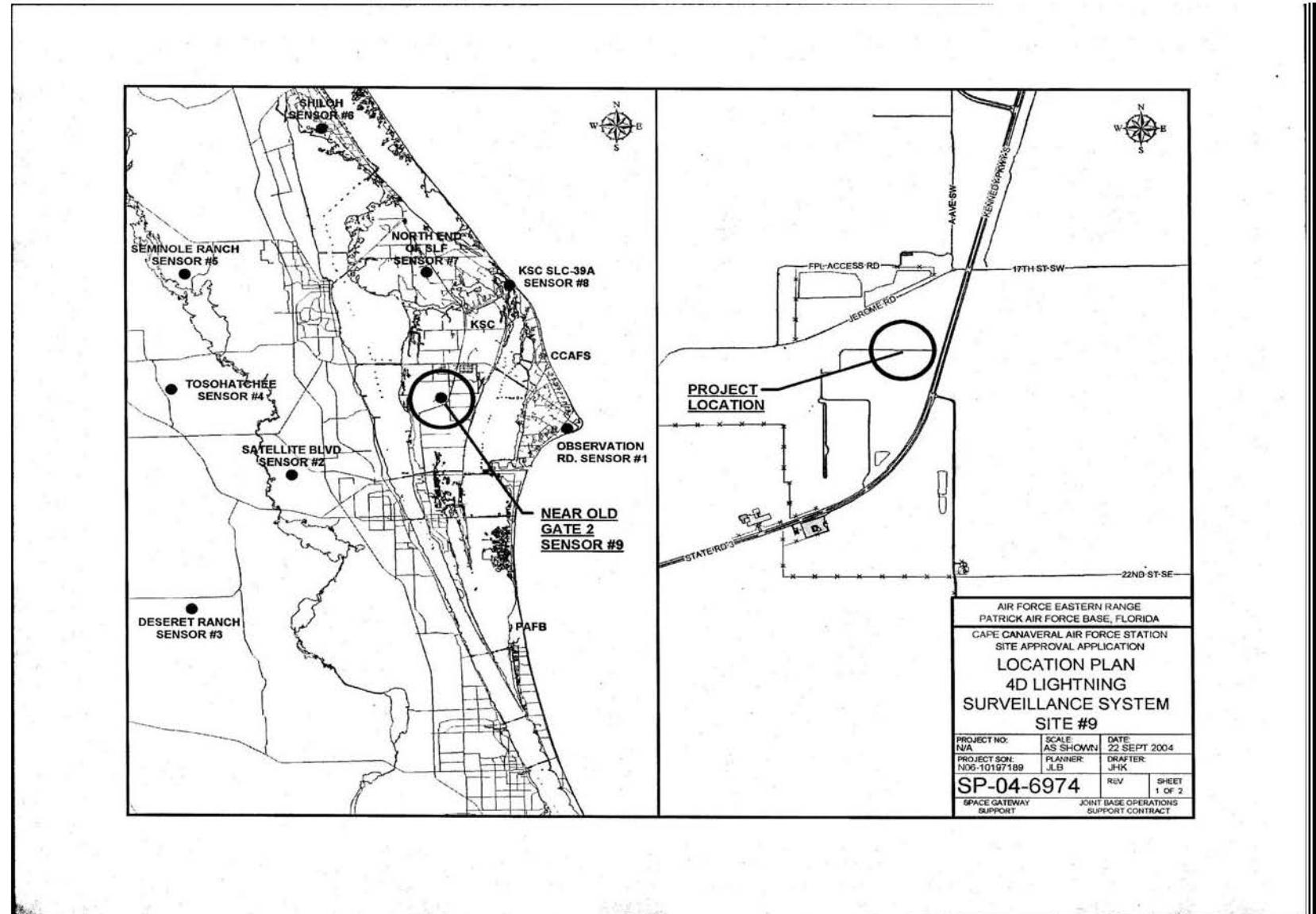


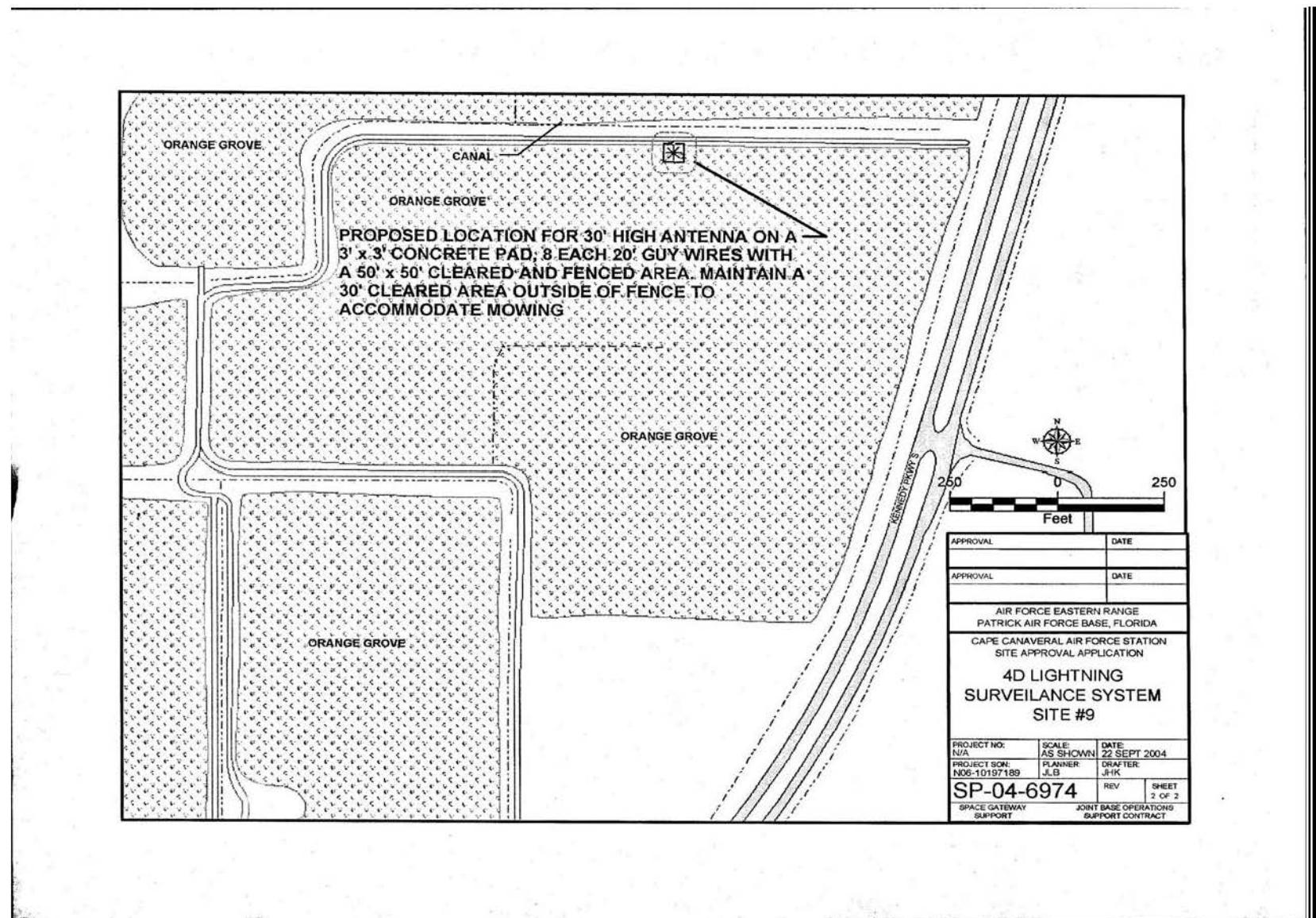












Appendix B

USFWS Biological Opinion



United States Department of the Interior

FISH AND WILDLIFE SERVICE

6620 Southpoint Drive, South

Suite 310

Jacksonville, Florida 32216-0912

IN REPLY REFER TO:

FWS/R4/ES-JAFL/05-0362

December 15, 2004

Colonel Mark H. Owen
Commander, 45th Space Wing, 45 CES/CEVP
1224 Jupiter Street, MS-9125
Patrick AFB, Florida 32925

RE: FWS Log No: 05-362

Dear Colonel Owen:

This document is the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed installation of a lightning detector antenna located on Cape Canaveral Air Force Station (CCAFS) in Brevard County, Florida, and its effects on the Florida scrub-jay (*Aphelocoma coerulescens*), southeastern beach mouse (*Peromyscus polionotus niveiventralis*), and the eastern indigo snake (*Drymarchon corais couperi*) per section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your request for formal consultation was received on November 24, 2004.

This biological opinion is based on information provided in the November 9, 2004 project proposal, telephone conversation of November 18 with Angy Chambers, and other sources of information. A complete administrative record is on file at the Ecological Service Office in Jacksonville, Florida.

Consultation History

On November 9, 2004, representatives of the 45th Space Wing sent the Service a letter requesting informal consultation on the proposed project.

On November 23, 2004, the Service telephoned the representatives of the 45th Space Wing to discuss the effects of the project. The Service determined that a formal consultation was needed. It was determined that the project "may affect" the Florida scrub-jay, the southeastern beach mouse, and "may affect not likely to adversely affect" the eastern indigo snake. Representatives of the 45th Space Wing initiated formal consultation.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The 45th Space Wing proposes to install a 25' tall antenna on a 3' by 3' concrete base with eight guy wires in Compartment 88. The entire area will be fenced and a 30' area will be cleared outside the fence. The proposed project will remove approximately 0.28 acres of restore oak scrub habitat. To compensate for this impact, the CCAFS will restore 1.12 acres of scrub habitat. The Service has described the action area to include 0.28 acres of oak scrub habitat.

Status of the Species

This section summarizes Florida scrub-jay, southeastern beach mouse, and eastern indigo snake biology and ecology as well as information regarding the status and trends of the Florida scrub-jay throughout its entire range. We use this information to assess whether a federal action is likely to jeopardize the continued existence of the above-mentioned species. The "Environmental Baseline" section summarizes information on status and trends of the Florida scrub-jay, southeastern beach mouse, and eastern indigo snake specifically within the action area. These summaries provide the foundation for our assessment of the effects of the proposed action, as presented in the "Effects of the Action" section.

Species/critical habitat description

Florida Scrub-Jay

Florida scrub-jays are about 10 to 12 inches long and weigh about 3 ounces. They are similar in size and shape to the blue jay (*Cyanocitta cristata*), but differ significantly in coloration (Woolfenden and Fitzpatrick 1996a). Unlike the blue jay, scrub-jays do not have a crest. They also lack the conspicuous white-tipped wing and tail feathers, black barring and bridle of the blue jay. The Florida scrub-jay's head, nape, wings, and tail are pale blue, and it is pale grey on its back and belly. Its throat and upper breast are lightly striped and bordered by a pale blue-grey "bib." The sexes of the scrub-jay are not distinguishable by plumage, and males average only slightly larger than females (Woolfenden 1978). The sexes may be differentiated by a distinct "hiccup" call vocalized only by females (Woolfenden and Fitzpatrick 1986). Scrub-jays less than about five months of age are easily distinguishable from adults; their plumage is smokey grey on the head and back, and they lack the blue crown and nape of the adults. Molting occurs between early June and late November, and peaks between mid-July and late September (Bancroft and Woolfenden 1982). During late summer and early fall, when the first basic molt is nearly complete, fledgling scrub-jays may be indistinguishable from adults in the field (Woolfenden and Fitzpatrick 1984). The wide variety of vocalizations of the scrub-jay are described in detail in Woolfenden and Fitzpatrick (1996b).

Scrub-jays are non-migratory, extremely sedentary, and have very specific habitat requirements (Woolfenden 1978). They usually reside in oak scrub vegetated with sand live oak, myrtle oak, inopine oak, and Chapman oak, along with saw palmetto, scrub palmetto, scattered sand pine, and rosemary. Such habitat occurs only on fine, white, drained sand, along the coastlines in Florida, and

in dunes deposited during the Pleistocene, when sea levels were much higher than at present (Laessle 1958, 1968). Scrub-jays are rarely found in habitats with more than 50 percent canopy cover over three meters in height (U.S. Fish and Wildlife Service 1990). The habitat required for the scrub-jay greatly restricts the bird's distribution. Active management either through burning or mechanical clearing is necessary to maintain optimum conditions. In general, scrub-jay habitat consists of dense thickets of scrub oaks less than nine feet tall, interspersed with bare sand used for foraging and storing of acorns (U.S. Fish and Wildlife Service 1990).

No critical habitat has been designated for this species; therefore none will be affected by the proposed project.

Southeastern beach mouse

The old field mouse (*Peromyscus polionotus*) is distributed throughout northeastern Mississippi, Alabama, Georgia, South Carolina and Florida. Certain subspecies of the oldfield mouse occur on beaches and dunes of the Atlantic coast of Florida and the Gulf coast of Alabama and Florida, and are collectively known as "beach mice". These dune dwelling mice are distinctly paler than inland populations and have been classified into eight subspecies.

The southeastern beach mouse (*P.p. niveiventris*) is classified as threatened. This species is slightly darker than the Anastasia beach mouse (*P.p. phasma*). The original distribution of the southeastern beach mouse was from Ponce Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami in Dade County. It is currently restricted to Volusia, Brevard, and St. Lucie Counties. Formerly, this subspecies occurred along about 175 miles of Florida's southeast coast; it now occupies about 50 miles, a significant reduction. This subspecies use both beach dunes and inland areas of scrub vegetation. The most seaward vegetation typically consists of sea oats, dune panic grass, railroad vine, beach morning glory, and camphor weed. Further landward, vegetation is more diverse, including beach tea, prickly pear cactus, saw palmetto, wax myrtle, and sea grape.

The southeastern beach mouse may use up to 20 burrows, usually located on the sloping side of a dune. Each burrow consists of an entrance tunnel, nest chamber, and escape tunnel. Beach mice are nocturnal, with most activity occurring on moonlit nights and less activity under stormy conditions or moonless nights.

No critical habitat has been designated for the southeastern beach mouse.

Eastern indigo snake

The eastern indigo snake is one of eight subspecies of a primarily tropical species; only the eastern indigo and the Texas indigo (*Drymarchon corais erebennus*) occur within the United States (U.S. Fish and Wildlife Service 1982). The eastern indigo snake is isolated from the Texas indigo snake by more than 600 miles (Moler 1992). The eastern indigo snake is the longest snake in North America, obtaining lengths of up to 104 inches (Ashton and Ashton 1981). Its color is uniformly lustrous-black, dorsally and ventrally, except for a red or cream-colored suffusion of the chin, throat, and sometimes the cheeks. Its scales are large and smooth

(central 3-5 scale rows are lightly keeled in adult males) in 17 scale rows at midbody. Its anal plate is undivided. Its antepenultimate supralabial scale does not contact the temporal postocular scales.

Historically, the eastern indigo snake occurred throughout Florida and into the coastal plain of Georgia, Alabama, and Mississippi (Loding 1922; Haltom 1931; Carr 1940; Cook 1954; Diemer and Speake 1983; Moler 1985a). It may have occurred in South Carolina, but its occurrence there cannot be confirmed. Georgia and Florida currently support the remaining, endemic populations of eastern indigo snake (Lawler 1977). In 1982, only a few populations remained in the Florida panhandle and the species was considered rare in that region. Nevertheless, based on museum specimens and field sightings, the eastern indigo snake still occurs throughout Florida even though they are not commonly seen (Moler 1985a).

In south Florida the eastern indigo snake is thought to be widely distributed and probably more abundant than in the northern limits of the range, especially compared to the low densities found in the panhandle of Florida. Given their preference for upland habitats, indigos are not found in great numbers in wetland complexes of the Everglades region, even though they are found in pinelands and tropical hardwood hammocks in extreme south Florida (Steiner *et al.* 1983).

Indigo snakes also occur in the Florida Keys. They have been collected from Big Pine and Middle Torch Keys, and are reliably reported from Big Torch, Little Torch, Summerland, Cudjoe, Sugarloaf, and Boca Chica Keys (Lazell 1989). Given the ubiquitous nature of the eastern indigo throughout the remainder of its range, it is likely that it also occurs on other Keys.

No critical habitat has been designated for the eastern indigo snake.

Life History/Population Dynamics

Florida Scrub-Jay

Florida scrub-jays are monogamous and remain mated throughout the year (Sprunt 1946; Woolfenden 1978). Scrub-jays have a social structure that involves cooperative breeding, a trait that the western North American populations of scrub-jay species do not exhibit (Woolfenden and Fitzpatrick 1984). The offspring generally stay with the parents for at least one year, forming a family group consisting of three or more family members. These "helpers" assist the breeding pair in all territorial and breeding activities except nest construction, egg-laying, and incubation. The family group resides in a territory with a well-defined boundary, defended year-round by all group members (Woolfenden and Fitzpatrick 1984). A well-developed intra-familial dominance hierarchy exists with breeding males being the most dominant, followed by helper males, breeding females, and finally, helper females (Woolfenden and Fitzpatrick 1977). Helpers participate in sentinel duties (McGowan and Woolfenden 1989), territorial defense, predator mobbing, and feeding of both nestlings (Stallcup and Woolfenden 1978) and fledglings (McGowan and Woolfenden 1990). The presence of helpers generally increases reproductive success and survival within the group, which naturally causes family size to increase (Woolfenden and Fitzpatrick 1978). However, the presence of humans near populations of

scrub-jays results in a variety of incidental encounters that usually increase the mortality of both juveniles and adults (Fitzpatrick *et al.* 1991).

Florida scrub-jay pairs occupy year-round, multi-purpose territories (Woolfenden and Fitzpatrick 1984; Fitzpatrick *et al.* 1991; Fitzpatrick *et al.* 1994). Territory size averages 22 to 25 acres, with a minimum size of about 12 acres. Territories are a limiting factor for scrub-jay populations. Because of this limitation, non-breeding males may remain in their natal territory as helpers for up to five years, waiting for either a mate or territory to become available (Fitzpatrick *et al.* 1991). New territories are established several ways: by replacing a lost breeder on a territory (Woolfenden and Fitzpatrick 1984); through "territorial budding," where a helper male becomes a breeder in a segment of his natal territory (Woolfenden and Fitzpatrick 1978); by inheriting a natal territory following the death of a breeder; or by establishing a new territory between existing territories (Woolfenden and Fitzpatrick 1984). Territories can also be obtained by creating suitable habitat in areas that were previously unsuitable through effective habitat management (Thaxton and Hingtgen 1994).

To become a breeder, a scrub-jay must acquire a territory as well as a mate. Evidence presented by Woolfenden and Fitzpatrick (1984) suggests that scrub-jays are permanently monogamous and occupy the same territory year after year. Courtship to form the pair is lengthy and ritualized, and involves posturing and vocalizations made by the male to the female (Woolfenden and Fitzpatrick 1996b). Copulation between the pair is generally out of the sight of other jays (Woolfenden and Fitzpatrick 1984). These authors also reported never observing copulation between unpaired jays, nor courtship behavior between a female and a jay other than her mate. Age at first breeding varies from one to seven years, although most breed between two and four years of age (Fitzpatrick and Woolfenden 1988). Persistent breeding populations of scrub-jays exist only where there are scrub oaks in sufficient quantities to provide an ample winter acorn supply, cover from predators, and nest sites during spring (Woolfenden and Fitzpatrick 1996a).

Nesting is synchronous, normally occurring from March through June (Woolfenden and Fitzpatrick 1990; Fitzpatrick *et al.* 1991). In suburban habitats, nesting is consistently initiated earlier (March and April) than in natural scrub habitat (Fleischer 1996). Clutch size ranges from 1 to 5 eggs, but is usually 3 or 4 eggs. Clutch sizes are generally larger (up to 6 eggs) in suburban habitats, and the birds attempt to rear more broods (Fleischer 1996). Eggs are incubated for 17 to 18 days, and fledging occurs 16 to 21 days after hatching (Woolfenden 1974, 1978; Fitzpatrick *et al.* 1991). Only the breeding female broods the eggs and nestlings (Woolfenden and Fitzpatrick 1984). Average survival is two fledglings per pair per year (Woolfenden and Fitzpatrick 1990; Fitzpatrick *et al.* 1991), and the presence of helpers improves success (Mumme 1992). Annual productivity must average at least 2 young per pair for a pair to maintain long term stability (Fitzpatrick *et al.* 1991). Data from Indian River County shows that mean annual productivity declines in suburban areas. Toland (1991) reported that productivity averaged 2.2 young fledged per pair in contiguous, optimal scrub, 1.8 young fledged per pair in fragmented, moderately developed scrub, 1.2 young per pair in suboptimal and only about 0.5 young fledged per pair in residential lawns.

Fledglings remain nutritionally dependent for about 10 weeks, during which time they are fed by both parents and helpers (Woolfenden 1975; McGowan and Woolfenden 1990). Survival of

scrub-jay fledglings to yearling class averages about 35 percent, while annual survival of adult males and females is around 80 percent (Fitzpatrick *et al.* 1991). The maximum observed lifespan of a Florida scrub-jay is 15.5 years (Woolfenden and Fitzpatrick 1996b).

Juveniles remain in their natal territory for up to five years before dispersing (Woolfenden and Fitzpatrick 1984). Once they pair and become breeders, generally within two territories of their natal grounds, they remain in their breeding territory until death. In suitable habitat, fewer than five percent of scrub-jays disperse more than five miles (Fitzpatrick *et al.* 1991). All documented long distance dispersals have been in unsuitable habitat such as woodland, pasture, or suburban plantations. Scrub-jay dispersal behavior is affected by intervening landscape matrix. Protected scrub habitats will most effectively sustain scrub-jay populations if they are located within a matrix that can be utilized and traversed by scrub-jays. Brushy pastures, scrubby corridors along railways, and county road rights-of-way, and open burned flatwoods provide links for colonization among scrub-jay subpopulations. Stith *et al.* (1996) believed that a dispersal distance of five miles is closer to biological maximum for scrub-jays.

Scrub-jays forage on or near the ground, often along the edge of natural or man-made openings. Insects, particularly orthopteran and lepidopteran larvae, comprise the majority of the animal diet throughout most of the year (Woolfenden and Fitzpatrick 1984). Acorns are by far the most important plant food, and from August to November scrub-jays harvest and cache thousands of scrub oak acorns throughout their territory (Fitzpatrick *et al.* 1991). It is estimated that 1/3 of these acorns are later recovered and eaten. Caching allows scrub-jays to eat acorns every month of the year. This reliance on acorns and caching may constitute a major reason for the scrub-jay's restriction to the oak scrub and sandy ridges within Florida (Fitzpatrick *et al.* 1991).

Status and Distribution

The Florida scrub-jay is geographically isolated from other species of scrub-jays found in Mexico and the Western United States. The Florida scrub-jay is found almost exclusively in peninsular Florida, and is restricted to scrub habitat (U.S. Fish and Wildlife Service 1990). The Florida scrub-jay was listed as a threatened species on June 3, 1987 (52 FR 20715-20719). The main causes responsible for the decline were as follows:

Habitat Destruction The existence of Florida scrub-jays throughout their range depends completely on existence of a particular seral stage of oak scrub habitat growing in conjunction with open, sandy soils. This habitat occurs naturally only in localized patches associated with recent or ancient shoreline deposits. By the time of listing, a large proportion of these habitat patches had been converted for human use, or were slated for imminent conversion. Most of the coastal scrub habitat had already been cleared for beachfront hotels, houses, and condominiums, and much of the central Florida scrub had been converted to citrus groves, housing developments, and commercial real estate. It was estimated that 40 percent of occupied scrub habitat had already been converted to other uses and total population of the species had declined by at least half. Owing to a rapid increase in human population numbers throughout central Florida, the pace of housing and agricultural development had accelerated since the 1960s, and showed no signs of abating.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes Reported shooting of scrub-jays and collection of the species as pets were considered threats.

Disease or Predation Disease and predation were not believed to be major threats at the time of listing.

The Inadequacy of Existing Regulatory Mechanisms The only laws protecting the Florida scrub-jay at the time of listing were the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*) and Florida State Law (Chapter 39-27, Florida Administrative Code). Neither of these laws protected the birds from habitat destruction, which constituted the major threat to the species.

Other Natural or Manmade Factors Suppression of fire by humans was identified as a factor in species decline at the time of the listing. Historically, lightning strikes started fires which maintained the sparse low scrub habitat required by Florida scrub-jays. Human efforts to suppress these fires to protect human interests allowed the scrub to become too dense and tall to support populations of scrub-jays. Vehicular mortality of scrub-jays due to accidental collisions along roadsides was recognized as a cause of the decline in some portions of the species' range.

Continued and current threats to the species include:

Habitat Destruction Scrub habitats continued to decline throughout peninsular Florida since listing occurred, and habitat destruction continues to be one of the main threats to the Florida scrub-jay. Cox (1987) noted local extirpations and major decreases in numbers of scrub-jays and attributed them to the clearing of scrub for housing and citrus groves. Eighty percent or more of the scrub habitats have been destroyed along the Lake Wales Ridge since pre-human settlement (Fitzpatrick *et al.* 1991). Fernald (1989), Fitzpatrick *et al.* (1991, 1994), and Woolfenden and Fitzpatrick (1996a) noted the role that habitat losses due to agriculture, silviculture, and commercial and residential development have continued to play in the decline in numbers of scrub-jays throughout the state. Statewide, estimates of scrub habitat loss range from 70 to 90 percent (Bergen 1994; Woolfenden and Fitzpatrick 1996a; Fitzpatrick *et al.* unpubl. data).

Toland (1999) estimates that approximately 85 percent of pre-settlement scrub habitats have been converted to other uses in Brevard County, due mainly to development activity and citrus conversion, and these were the most important factors that attributed to the scrub-jay decline between 1940 and 1990. A total of only 10,656 acres of scrub and scrubby flatwoods remain in Brevard County (outside of federal ownership), of which only 1,600 acres (15 percent) is in public ownership for the purposes of conservation. Less than 1,977 acres of an estimated pre-settlement of 14,826 acres of scrubby flatwoods habitat remain in Sarasota County, mostly occurring in patches averaging less than 2.5 acres in size (Thaxton and Hington 1996). According to Fernald (1989), in the Treasure Coast region of Florida (Indian River, Saint Lucie, Martin, and Palm Beach Counties), only 10,673 acres of viable coastal scrub and scrubby flatwoods remained; he estimated that 95 percent of scrub had already been destroyed for development purposes in Palm Beach County.

Habitat destruction not only reduces the amount of area scrub-jays can occupy, but also increases fragmentation of habitat. As more scrub habitat is altered, the habitat is cut into smaller and

smaller pieces, separated from other patches by larger distances. Such fragmentation increases the probability of genetic isolation, which is likely to increase extinction probability (Fitzpatrick *et al.* 1991; Woolfenden and Fitzpatrick 1991; Snodgrass *et al.* 1993; Stith *et al.* 1996; Thaxton and Hingten 1996). Dispersal distances of scrub-jays in fragmented habitat are further than in optimal unfragmented habitats (Thaxton and Hingten 1996; Breininger 1999).

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes The Service knows of only one case in Volusia County where a Florida scrub-jay has been shot. Several other cases were investigated, but there was no evidence revealing the taking of any more jays through this means (J. Oliveros, pers. comm.). However, in areas where jays are tamed by the presence of human-feeding activity, the species becomes bold, and therefore vulnerable to recreational or malicious shooting (Woolfenden and Fitzpatrick 1996b).

Disease or Predation Most Florida scrub-jays probably die from predation. The second most frequent cause may be disease, or predation on disease-weakened jays (Woolfenden and Fitzpatrick 1996b). Known predators of Florida scrub jays are listed by Woolfenden and Fitzpatrick (1990) and Fitzpatrick *et al.* (1991); the list includes eastern coachwhip (*Masticophis flagellum*, known to eat adults, nestlings, and fledglings) and the eastern indigo snake (*Drymarchon corais couperi*, known to eat adults and fledglings). Mammalian predators include bobcats (*Lynx rufus*), raccoons (*Procyon lotor*), sometimes cotton rats (*Sigmodon hispidus*, known to eat eggs), and domestic cats (*Felis cattus*, known to eat adults). Fitzpatrick *et al.* (1991) suspect that populations of domestic cats are able to eliminate small populations of scrub-jays. Avian nest predators include great horned owls (*Bubo virginianus*), Eastern screech-owl (*Otus asio*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), and possibly fish crow (*Corvus ossifragus*), American crow (*C. brachyrhynchos*), and blue jay (*Cyanocitta cristata*). Fitzpatrick *et al.* (1991) reported that overgrown scrub habitats are often occupied by the blue jay, which may be one factor limiting scrub-jay populations in such areas. Raptors which seem to be important predators of adult scrub-jays are merlin (*Falco columbarius*), sharp-shinned hawk (*Accipiter striatus*), and Cooper's hawk (*A. cooperii*). During migration and winter, these three hawks and the harrier are present in areas which contain scrub habitat, and jays may experience frequent encounters (as many as one pursuit a day) with them (Woolfenden and Fitzpatrick 1990). In coastal scrub, Woolfenden and Fitzpatrick (1996b) report that scrub-jays are vulnerable to predation by hawks in October, March, and April, when high densities of migrating accipiters and falcons are present. Woolfenden and Fitzpatrick (1996b) and Toland (1999) suggest that in overgrown scrub habitats, hunting efficiency for scrub-jay predators is increased. Bowman and Averill (1993) noted that scrub-jays occupying fragments of scrub located in or near housing developments were more prone to predation by house cats and competition from blue jays and mockingbirds. Woolfenden and Fitzpatrick (1996a, 1996b) stated that proximity to housing developments (and increased exposure to domestic cats) needs to be taken into consideration when designing scrub preserves. Young scrub-jays are especially vulnerable to ground predators (e.g., snakes and mammals) prior to their being fully capable of sustained flight.

The Florida scrub-jay hosts 2 protozoan blood parasites (*Plasmodium cathemerium* and *Haemoproteus danilewskyi*), but incidence is low (M. Garvin pers. comm., cited in Woolfenden

and Fitzpatrick 1996b). Several scrub-jays sick from these two agents in March 1992 survived to become breeders. The Florida scrub-jay carries at least 3 types of mosquito-borne encephalitis (St. Louis, eastern equine, and "Highlands jay"; M. Garvin and J. Day pers. comm., cited in Woolfenden and Fitzpatrick 1996b). Of particular concern is the arrival of West Nile virus (the agent of another type of encephalitis) in Florida during 2001; since corvids have been particularly susceptible to the disease in states north of Florida, it is expected that scrub-jays will be affected by its arrival.

Woolfenden and Fitzpatrick (1996b) noted 3 episodes of elevated mortality (especially among juveniles) in 26 years at Archbold Biological Station. Each of these incidents occurred in conjunction with elevated water levels following unusually heavy rains in the fall, although not all such years cause high mortality. During the most severe of these presumed epidemics (August 1979 through March 1980), the entire juvenile cohort (with the exception of 1) and almost half of the breeding adults died (Fitzpatrick and Woolfenden 1984; Woolfenden and Fitzpatrick 1990). The 1979-1980 incident coincided with a known outbreak of eastern equine encephalitis among domestic birds in central Florida (J. Day pers. comm., cited in Woolfenden and Fitzpatrick 1996b). From the fall of 1997 through the spring of 1998, the continuing population decline of Florida scrub-jays along the Atlantic coast and in central Florida may have been augmented by an epidemic (Breininger and Oddy 1998; Breininger 1999).

In winter-summer of 1973, 15 species of helminth fauna (including 8 nematodes, 5 trematodes, 1 cestode, and 1 acanthocephalan) were found in 45 Florida scrub-jays collected in south-central Florida; the parasite load was attributed to a varied arthropod diet (Kinsella 1974). These naturally-occurring parasites are not believed to contribute significantly to population declines.

Larvae of a colrophorid dipteran, *Philornis* (= *Neomusca*) *porteri*, occur irregularly on scrub-jay nestlings. The species pupates in the base of the nest; larvae locate in nares, mouth flanges, bases of remiges, and toes. Apparently no serious effect on the scrub-jay host occurs (Woolfenden and Fitzpatrick 1996b). In addition, 1 undescribed chewing louse (*Myrsidea* sp., R. Price pers. comm., cited in Woolfenden and Fitzpatrick 1996b), 1 wing-feather mite (*Pterodectes* sp.), 2 chiggers (*Eutrombicula lipovskyana*), and a flea (*Echidnophaga gallinacea*; J. Kinsella pers. comm., cited in Woolfenden and Fitzpatrick 1996b) occur on some individuals, usually at low densities. Nymphs and larvae of four ticks (*Amblyomma americanum*, *A. tuberculatum*, *Haemaphysalis leporispalustris*, and *Ixodes scapularis*) are known to occur on scrub-jays, as well as the larvae of the tick *Amblyomma maculatum* (L. Durden and J. Keirans pers. comm., cited in Woolfenden and Fitzpatrick 1996b). These naturally-occurring parasites are not believed to contribute significantly to population declines.

The Inadequacy of Existing Regulatory Mechanisms Woolfenden and Fitzpatrick (1996a) state the importance of enforcing existing federal laws regarding the management of federal lands as natural ecosystems for the long-term survival of the Florida scrub-jay. Such enforcement is necessary to increase and secure the populations of the species on Merritt Island National Wildlife Refuge, Cape Canaveral Air Force Station, and Ocala National Forest. Florida's State Comprehensive Plan and Growth Management Act of 1985 is administered mostly by regional and local governments. Regional Planning Councils administer the law through Development of

Regional Impact Reviews; at the local level, although comprehensive plans contain policy statements and natural resource protection objectives, they are only effective if counties enact ordinances. As a general rule, counties have not enacted and/or enforced ordinances to be very effective in protecting scrub-jays (Fernald 1989).

The Wildlife Code of the state of Florida (Chapter 39, Florida Administrative Code) prohibits taking of individuals of threatened species or parts, thereof or their nests or eggs except as authorized. The statute does not prohibit clearing of habitat occupied by protected species, which limits the ability of the Florida Fish and Wildlife Conservation Commission to protect the Florida scrub-jay.

Other Natural or Manmade Factors Human interference with natural fire regimes has continued to play an important part in the decline of the scrub-jay, and today may exceed habitat loss as the single most important factor. Lightning strikes cause virtually all naturally-occurring fires in south Florida scrub habitat (Abrahamson 1984; Hofstetter 1984). Fire has been noted to be important in maintenance of scrub habitat for decades (Nash 1895; Harper 1927; Webber 1935; Davis 1943; Laessle 1968; Abrahamson *et al.* 1984). Human efforts to prevent and/or control natural fires have allowed the scrub to become too dense and tall to support populations of scrub-jays, resulting in the decline of local populations of scrub-jays throughout the state (Fernald 1989; Fitzpatrick *et al.* 1994; Percival *et al.* 1995; Stith *et al.* 1996; Thaxton and Hingten 1996; Woolfenden and Fitzpatrick 1990, 1996a; Toland 1999). Woolfenden and Fitzpatrick (1996a) cautioned, however, that fire applied too frequently to scrub habitat also can result in local extirpations. Experimental data at Archbold Biological Station (Fitzpatrick and Woolfenden, unpubl. data) demonstrate that fire-return intervals varying between 5 and 15 years are optimal for long-term maintenance of productive Florida scrub-jay populations in central Florida.

Stith *et al.* (1996) estimated that at least 2,100 breeding pairs were living in overgrown habitat. Toland (1999) reported that most of the remaining scrub (estimated to be only 15 percent of the original acreage) within Brevard County is extremely overgrown due to fire suppression. He further suggests that the overgrowth of scrub habitats reduces the number and size of sand openings which are crucial to not only scrub-jays, but also many other scrub plants and animals. Reduction in the number of potential scrub-jay nesting sites, acorn cache sites, and foraging sites presents a problem for jays. Fernald (1989) reported that overgrowth of scrub results in the decline of species diversity and abundance and a reduction in the percentage of open sandy patches (Fernald 1989; Woolfenden and Fitzpatrick 1996b). Fitzpatrick *et al.* (1994) believed that fire suppression was just as responsible for the decline of the scrub-jay as habitat loss, especially in the northern third of its range. Likewise, the continued population decline of scrub-jays within Brevard County between 1991 and 1999 has been attributed mainly to the overgrowth of remaining habitat patches (Breininger and Oddy 1998). Breininger *et al.* (1999) concluded that optimal habitat management is essential in fragmented ecosystems maintained by periodic fire, especially to minimize risks of decline and extinction resulting from epidemics and hurricanes.

Fitzpatrick *et al.* (1991, 1994) and Woolfenden and Fitzpatrick (1996a) expressed concern for the management practices taking place on federal lands at Ocala National Forest, Merritt Island

National Wildlife Refuge/Kennedy Space Center, and Cape Canaveral Air Force Station, containing the two largest contiguous populations of Florida scrub-jays. They predicted that fire suppression and/or too frequent fires (on the latter two) and silvicultural activities involving the cultivation of sand pine on Ocala National Forest would be responsible for continuing decline of scrub-jays in these large contiguous areas of scrub where populations should be most secure.

Housing and commercial developments within scrub habitats are accompanied by the development of roads; since scrub-jays frequently forage along roadsides and other openings in the scrub, there is a high probability of scrub-jays being killed by passing cars. Research by Mumme *et al.* (2000) indicated that clusters of Florida scrub-jay territories located along roadsides represent population sinks (breeder mortality exceeds production of breeding-aged recruits), which can be maintained only by immigration. Since this species may be attracted to roadsides because of the open habitat characteristics, road mortality presents a significant and growing management problem throughout the remaining range of the Florida scrub-jay (Dreschel *et al.* 1990; Mumme *et al.* 2000), and proximity to roads needs to be considered when designing scrub preserves (Woolfenden and Fitzpatrick 1996a).

Also a potential problem in suburban areas containing Florida scrub-jays is the supplemental feeding of the species by humans (Bowman and Averill 1993; R. Bowman unpubl. data, cited in Woolfenden and Fitzpatrick 1996a). The presence of additional food may allow scrub-jays to persist in fragmented habitats, but recruitment in these populations is lower than in native habitats. However, even though human-feeding of jays may postpone local extirpations, long-term survival cannot be ensured in the absence of protecting native oak scrub habitat, necessary for nesting. In addition, local populations of jays may be artificially elevated by the presence of supplemental food during the nonbreeding season, but during the summer and fall there isn't enough native habitat to support them, resulting in population sinks; the presence of such sinks needs to be considered when managing wild populations that are located close to residential development.

Scrub-jays in suburban settings often nest high in tall shrubbery; during March winds, these nests tend to be susceptible to destruction (R. Bowman and G.E. Woolfenden unpubl data, cited in Woolfenden and Fitzpatrick 1996b).

Hurricanes pose a potential risk for Florida scrub-jays, although the exact impact of such catastrophic events remains unknown. Breininger *et al.* (1999) modeled the effects of epidemics and hurricanes on scrub-jay populations in varying stages of habitat quality. Small populations of scrub-jays are more vulnerable to extinction where epidemics and hurricanes are common. Storm surge from a category 3 to 5 hurricane could inundate entire small populations of scrub-jays, and existing habitat fragmentation could prevent repopulation of affected areas. The model also predicted that long-term habitat degradation had greater influence on extinction risk than either hurricanes or epidemics.

Fernald (1989) reported that many of the relatively few remaining patches of scrub within the Treasure Coast region of Florida had been degraded by trails created by off-road vehicles, illegal dumping of construction debris, abandoned cars and appliances or household waste. Also a

problem was the invasion of these areas by exotic species, including Brazilian pepper, cypress pine, Australian pine, and others. Other human-induced impacts identified by Fernald include the introduction of domestic dogs and cats, black rats, greenhouse frogs, giant toads, Cuban treefrogs, brown anoles, and other exotic animal species. These exotic species compete with scrub-jays for both space and food.

A statewide scrub-jay census was last conducted in 1992-1993. At that time, there were an estimated 4,000 pairs of scrub-jays remaining in the state (Fitzpatrick *et al.* 1994). The scrub-jay was considered extirpated in 10 counties (Alachua, Broward, Clay, Dade, Duval, Gilchrist, Hernando, Hendry, Pinellas, and St. Johns), and in an additional 5 counties (Flagler, Hardee, Levy, Orange, and Putnam), numbers were reduced to 10 or fewer pairs. In Gulf coast counties (from Levy south to Collier), populations are close to becoming extirpated (Fitzpatrick *et al.* 1994b; Woolfenden and Fitzpatrick 1996a). In 1992-1993, population numbers in 19 of the counties were below 30 or fewer groups. In the past, most of these counties would have contained hundreds or even thousands of groups (Fitzpatrick *et al.* 1994a). Based on the amount of destroyed scrub habitat, scrub-jay population loss along the Lake Wales Ridge is 80 percent or more since pre-human settlement (Fitzpatrick *et al.* 1991). Since the early 1980s, Fitzpatrick *et al.* (1994a) estimated that in the northern third of the species' range, the Florida scrub-jay has declined somewhere between 25 and 50 percent. In the last decade alone, the species may have declined statewide by as much as 25 to 50 percent (Stith *et al.* 1996).

On protected lands, jays have continued to decline due to inadequate habitat management (Stith 1999). However, over the last several years, steps to reverse this decline have occurred, and management of scrub habitat is ongoing in many areas of the state (Hastie and Eckl 1999; Stith 1999; TNC 2001; A. Birch, pers. comm.; M. Camardese, pers. comm.).

Based on analysis of Brevard County historic aerial photography and soil maps, it is estimated that pre-settlement oak scrub, scrubby pine flatwoods, and coastal scrub/strand covered at least 53,000 acres outside of federal lands (Toland 1999). Assuming average territory size of 25 acres per breeding pair, there were probably originally 2,200 to 2,500 Florida scrub-jay territories within Brevard County. The 1992-1993 statewide survey estimated that on federal lands within Brevard County, there were 860 pairs of Florida scrub-jays remaining; outside of federal lands, 276 breeding pairs of scrub-jays were present (Fitzpatrick *et al.* 1994). The figure on non-federal lands within Brevard County had dropped to 185 in 1999 (Toland 1999), illustrating a precipitous decline of the scrub-jay population within the county. A total of 1,620 acres of scrub habitat have been purchased (outside federal ownership) for preservation by Brevard County EEL, the St. Johns River Water Management District (SJRWMD), and the Florida Department of Environmental Protection (FDEP); an additional 2,500 acres of potential scrub-jay habitat are proposed for acquisition by EEL and the SJRWMD (Toland 1999). All of these parcels would need extensive restoration and management to obtain maximum usage by scrub-jays. Over the last several years, an extensive effort to restore and manage these parcels has been undertaken by EEL, the SJRWMD, and FDEP (A. Birch, pers. comm.).

Stith (1999) utilized a spatially-explicit individual-based population model developed specifically for the Florida scrub-jay to complete a metapopulation viability analysis of the

species state-wide. The population was divided into 21 metapopulations demographically isolated from each other (Figure 1). A series of simulations were run for each of the 21 metapopulations based on different scenarios of reserve design ranging from the minimal configuration consisting of only currently protected patches of scrub (no acquisition option) to the maximum configuration, where all remaining significant scrub patches were acquired for protection (complete acquisition option). The assumption was made that all areas that were protected were also restored and properly managed.

Results from Stith's (1999) simulation model included estimates of extinction, quasi-extinction (the probability of a scrub-jay metapopulation falling below 10 pairs), and percent population decline. By comparing the results, the different state-wide metapopulations were then ranked in terms of vulnerability. The model predicted that five metapopulations (NE Lake, Martin, Merritt Island, Ocala National Forest, and Lake Wales Ridge, see Figure 1) have low risk of quasi-extinction. Two of the five (Martin and Lake), however, experienced significant population declines under the "no acquisition" option that could be improved by additional acquisitions.

Eleven of the remaining 21 metapopulations were shown to be highly vulnerable to quasi-extinction if no additional habitat were acquired (N Brevard, Levy, Central Charlotte, Central Brevard, W Volusia, NW Charlotte, St. Lucie, Citrus, Lee, Manatee, and Pasco). By acquiring all or most of the remaining scrub habitat, the model predicted that the risk of quasi-extinction would be greatly reduced for 7 of the 11 (N Brevard, Levy, Central Charlotte, Central Brevard, W Volusia, NW Charlotte, and St. Lucie). The model predicted that the remaining 4 metapopulations (Citrus, Lee, Manatee, and Pasco) would moderately benefit if additional acquisitions were made.

Stith (1999) classified two metapopulations (S Brevard and Sarasota) as moderately vulnerable with a moderate potential for improvement; they both had one or more fairly stable subpopulations of scrub-jays under protection, but the model predicted large population declines. Without further acquisitions, the remainder of the metapopulation could collapse, making the protected subpopulations vulnerable to epidemics or other catastrophes.

Three of the metapopulations evaluated by Stith (1999) (S Palm Beach, Central Lake, and Flagler) were classified as highly vulnerable to quasi-extinction and had low potential for improvement, since little or no habitat is available to acquire or restore.

Southeastern beach mouse

The southeastern beach mouse is one of five subspecies of the old field mouse that inhabit coastal dune communities along the central Atlantic coast of Florida. All beach mice are differentiated from the inland subspecies because of a variety of fur patterns on the head, shoulders, and rump. The overall dorsal coloration is more reduced in coastal subspecies, is lighter in color, and is less extensive than on those of the inland subspecies (Sumner, 1926; Bowen, 1968).

Beach mice are nocturnal and forage for food throughout the dune system. They feed primarily on seeds and fruits of bluestem (*Schizachyrium maritimum*), sea oats (*Uniola paniculata*), and evening primrose (*Oenothera humifusa*); however, insects are also an important component of their diet (Moyers, 1996). Potential predators include snakes, bobcats, foxes, raccoons, skunks, owls, and feral cats and dogs. House mice may compete with the southeastern beach mouse.

Optimal beach mouse habitat is comprised of a mix of interconnected habitats including primary, secondary, scrub dunes, and interdunal areas. Beach mice dig burrows mainly in the primary dunes and in other secondary and interior scrub dunes where the vegetation provides cover. In coastal environments, the term "scrub" and "scrub dunes" refer to habitat or vegetation types where scrub oaks are dominants of a community adjacent to and landward of secondary and primary dunes. Interior habitat can include vegetation types such as grassy forbs. There is substantial variation in scrub oak density and cover within and scrub dunes throughout ranges of beach mice. The variation, resembling an ecological gradient, is represented by scrub oak woodland with a relatively closed canopy at one end and at the other extreme of the gradient, scrub dunes are relatively open with patchy scrub ridges and intervening swales or interdunal flats dominated by herbaceous plants.

Beach mice along the Gulf Coasts of Florida and Alabama generally live about nine months (Swilling, 200a). Field trapping research indicates that 68 percent (average) of mice alive in one month will survive to the next month. Actual survival rates indicate that 18.5 to 87 percent of individuals survive no more than four months and some mice live between 12 and 20 months (Blair, 1951; Rave and Holler, 1992). Holler et al., (1997) found that 44.26 percent of beach mice captured for the first time survived to the next season (winter, spring, summer, and fall). The mean survival rate for mice captured for a second time to subsequent capture was higher (53.90 percent). More than ten percent of mice survived three seasons after first capture, and four to eight percent survived more than one year after initial capture. Mice held in captivity by Blair (1951) and at Auburn University (Holler, 1995) have lived three years or more.

Reproduction

Beach mice are monogamous, pairing for life (Smith, 1966). Male beach mice are capable of breeding at an age of 25 days. Female beach mice are able to begin breeding at an age of 35 days. Gestation averages 24 days and litter sizes average three to four with extreme of one and eight individuals. Littering intervals may be as short as 26 days. Peak breeding season for beach mice is in autumn and winter, declining in spring, and falling to low levels in summer. However, pregnant and lactating beach mice have been caught during summer trapping periods (Moyers et al., 1999). In essence, female beach mice can produce a litter every month once mature and live about eight month being able to reproduce. This, on an annual basis, a pair of beach mice could produce an average of 24 to 32 young a year.

Generally, population density of beach mice reaches peak numbers in the late autumn into spring (Rave and holler, 1992; Holler et al., 1997). Peak breeding period occurs in fall and winter and appear to coincide with increased availability of seeds and fruits from the previous growing season. Seasonal and annual variation in size of individual populations may be great (Rave and

Holler, 1992; Holler et al., 1997). Food supplementation studies showed that *P. polionotus* mouse populations increased when foods were abundant; thus, populations of *P. polionotus* and beach mice appear to be food-limited (Galindo-Leal and Krebs, 1998). Densities of southeastern beach mice in a 3.9-acre area ranged from 5.5 to 26.3 mice/acres on Merritt Island NWR during a 13-month period (Extine and Stout, 1987)

Eastern indigo snake

Over most of its range, the eastern indigo snake frequents a diversity of habitat types such as pine flatwoods, scrubby flatwoods, xeric sandhill communities, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human altered habitats. Eastern indigo snakes need a mosaic of habitats to complete their annual cycle. Interspersion of tortoise-inhabited sandhills and wetlands improves habitat quality for the indigo snakes (Landers and Speake 1980; Auffenberg and Franz 1982). Eastern indigo snakes require sheltered retreats from winter cold and desiccation (Bogert and Cowles 1947). Whenever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise (*Gopherus polyphemus*), the burrows of which shelter the indigo snakes from the winter cold and desiccating sandhills environment (Bogert and Cowles 1947; Speake et al. 1978; Layne and Steiner 1996). This dependence seems especially pronounced in Georgia, Alabama, and the panhandle of Florida, where the eastern indigo snake is largely restricted to the vicinity of the sandhill habitats occupied by gopher tortoises (Diemer and Speake 1981; Moler 1985b; Mount 1975). The high use of xeric sandhill habitats throughout the northern portion of the eastern indigo's range can be attributed primarily to the availability of thermal refuge afforded by gopher tortoise burrows in the winter. No such refugia is widely available off of the sandhills regions of southern Georgia and northern Florida. In wetter habitats that lack gopher tortoises, eastern indigo snakes may take shelter in hollowed root channels, hollow logs, or the burrow of rodents, armadillos, or crabs (Lawler 1977; Moler 1985b; Layne and Steiner 1996).

In the milder climates of central and southern Florida, eastern indigo snakes exist in a more stable thermal environment, where the availability of thermal refugia may not be as critical to the snakes' survival, especially in extreme southern Florida. Throughout peninsular Florida, the eastern indigo snake can be found in all terrestrial habitats which have not suffered high urban development. They are especially common in hydric hammocks throughout this region (Moler 1985a). In central and coastal Florida, eastern indigo snakes are typically found in the State high, sandy ridges. In extreme south Florida, these snakes are mainly found in pine flatwoods, pine rockland, and tropical hardwood hammock habitats, and in most other undeveloped areas (Kuntz 1977). Eastern indigo snakes also use some agricultural lands (e.g. citrus) and various types of wetlands (Layne and Steiner 1996).

Even though thermal stresses may not be a year-round limiting factor in southern Florida, eastern indigo snakes seek and use underground refugia. On the sandy central and coastal ridges of south Florida, indigo snakes use gopher tortoise burrows (62 percent) more than other underground refugia (Layne and Steiner 1996). Other underground refugia used by indigo snakes include burrows of armadillos (*Dasypus novemcinctus*), cotton rats (*Sigmodon hispidus*), and land crabs; burrows of unknown origin; natural ground holes; hollows at the base of trees or

shrubs; ground litter; trash piles; and in the crevices of rock-lined ditch walls (Layne and Steiner 1996). These refugia sites are used most frequently where tortoise burrows are not available, principally in the low-lying areas off of the central and coastal ridges.

Smith (1987) radio-tagged hatchling, yearling, and gravid eastern indigo snakes and released them in different habitat types on St. Marks National Wildlife Refuge in Wakulla County, Florida, in 1985 and 1986. Smith monitored the behavior, habitat use, and oviposition sites selected by gravid female snakes and concluded that the diverse habitats, including high pineland, pine-palmetto flatwoods, and permanent open ponds, were important for the eastern indigo snakes seasonal activity. In this study, habitat use also differed by age-class and season; adult indigo snakes often used gopher tortoise burrows during April and May, while juveniles used root and rodent holes. The indigo snakes used gopher tortoise burrows for oviposition sites in high pineland areas, but stumps were chosen in flatwoods and pond edge habitats (Smith 1987).

Monitoring of radio-fitted indigo snakes on the central ridge of south Florida indicate that snakes in this part of the state use a wide variety of natural, disturbed, and non-natural habitat types throughout the year. On the ridge itself, indigos favor mature oak phase scrub, turkey oak sandhill, and abandoned citrus grove habitats, while snakes found off the sandy ridges use flatwoods, seasonal ponds, improved pasture, and active and inactive agricultural lands. There was no apparent selection for one habitat type over another as the use of habitats closely reflected the relative availability and distribution of the vegetation types in these areas (Layne and Steiner 1996).

In extreme south Florida (the Everglades and Florida Keys), indigo snakes are found in tropical hardwood hammocks, freshwater marshes, abandoned agricultural lands, coastal prairie, mangrove swamps, and human altered habitats (Steiner *et al.* 1983). It is suspected that they prefer hammocks and pine forests since most observations occur there and use of these areas are disproportionate compared to the relatively small total area of these habitats (Steiner *et al.* 1983).

Reproduction

Most information on the reproductive cycle of the eastern indigo snake is from data collected in northern Florida. Here, breeding occurs between November and April, and females deposit four to twelve eggs during May or June (Moler 1992). Speake (1993) reported an average clutch size of 9.4 for 20 captive bred females. Young hatch in approximately three months, from late May through August. Peak hatching activity occurs during August and September, while yearling activity peaks in April and May (Groves 1960; Smith 1987). Limited information on the reproductive cycle in south-central Florida suggests that the breeding and egg laying season may be extended in south-central and south Florida. In this region, breeding extends from June to January, laying occurs from April to July, and hatching occurs during mid-summer to early fall (Layne and Steiner 1996).

Female indigo snakes can store sperm and delay fertilization of eggs; there is a single record of a captive snake laying five eggs (at least one of which was fertilized) after being isolated for more

than four years (Carson 1945). There is no information on how long eastern indigo snakes live in the wild; in captivity, the longest an eastern indigo snake lived was 25 years, 11 months (Shaw 1959).

Feeding

The eastern indigo snake is an active terrestrial and fossorial predator that will eat any vertebrate small enough to be overpowered. Layne and Steiner (1996) documented several instances of indigos flushing prey from cover and then chasing it. Though unusual, indigo snakes may also climb shrubs or trees in search of prey. An adult eastern indigo snakes diet may include fish, frogs, toads, snakes (venomous and nonvenomous), lizards, turtles, turtle eggs, juvenile gopher tortoises, small alligators, birds, and small mammals (Keegan 1944; Babis 1949; Kochman 1978; Steiner *et al.* 1983). Juvenile indigo snakes eat mostly invertebrates (Layne and Steiner 1996).

Movements

Indigo snakes range over large areas and into various habitats throughout the year, with most activity occurring during summer and fall (Smith 1987; Moler 1985b; Speake 1993). The average home range of an eastern indigo snake is 12 acres during the winter (December - April), 106 acres during late spring early summer (May - July), and 241 acres during late summer and fall (August - November) (Speake *et al.* 1978). Adult male eastern indigo snakes have larger home ranges than adult females and juveniles; their home range may encompass as much as 553 acres in the summer (Moler 1985b; Speake 1993). By contrast, a gravid female may use from 4 to 106 acres (Smith 1987). These estimates are comparable to those found by Layne and Steiner (1996) in south central Florida, who determined adult male home ranges average about 183 acres, while adult females average about 42 acres.

Status and Distribution

As stated earlier, the eastern indigo snake was listed based on population decline caused by habitat loss, over-collection for the pet trade, and mortality from gassing gopher tortoise burrows to collect rattlesnakes (Speake and Mount 1973; Speake and McGlinchy 1981). At the time of listing, the main factor in the decline of the eastern indigo snake was attributed to exploitation for the pet trade. As a result of effective law enforcement, the pressure from collectors has declined, but still remains a concern (Moler 1992).

The eastern indigo snake utilizes a majority of habitats available, but tends to prefer open, undeveloped areas (Kuntz 1977). Because of its relatively large home range, this snake is especially vulnerable to habitat loss, degradation, and fragmentation (Lawler 1977; Moler 1985b). Lawler (1977) noted that eastern indigo snake habitat had been destroyed by residential and commercial construction, agriculture, and timbering. He stated that the loss of natural habitat is increasing because of these threats in Florida and that indigo snake habitat is being lost at a rate of five percent per year. Low density residential housing is also a potential threat to the species, increasing the likelihood that the snake will be killed by property owners and domestic

pets. Extensive tracts of wild land are the most important refuge for large numbers of eastern indigo snakes (Diemer and Speake 1981; Moler 1985b).

Additional human population growth will increase the risk of direct mortality of the eastern indigo snake from property owners and domestic animals. Pesticides that bioaccumulate through the food chain may present a potential hazard to the snake as well pesticide use on crops or for forestry/silviculture would propose a pulse effect to the indigo snake (Speake 1993). Direct exposure to treated areas and secondary exposure by ingestion of contaminated prey could occur. Secondary exposure to rodenticides used to control black rats may also occur (Speake 1993).

The wide distribution and territory size requirements of the eastern indigo snake makes evaluation of status and trends very difficult. We believe that activities such as collecting and gassing have been largely abated through effective enforcement and protective laws. However, despite these apparent gains in indigo snake conservation, we believe that the threats described above are acting individually and collectively against the eastern indigo snake. Though we have no quantitative data with which to evaluate trends of the eastern indigo snake in Florida, we surmise that the population as a whole is declining because of continued habitat destruction and degradation. Natural communities continue to be altered for agriculture, residential, and commercial purposes, most of which are incompatible with the habitat needs of the eastern indigo snake (Kautz 1993). Habitat destruction and alteration is probably most substantial along the coasts, Keys and high central ridges of southcentral Florida where human population growth is expected to continue to accelerate. Agricultural interests (principally citrus) continue to destroy large expanses of suitable natural habitat in south Florida.

Even with continued habitat destruction and alterations, indigo snakes will probably persist in most localities where small, fragmented pieces of natural habitat remain. Tracts of appropriate habitat of a few hundred to several thousand acres may be sufficient to support a small number of snakes. Unfortunately, we believe that current and anticipated habitat fragmentation will result in a large number of isolated, small groups of indigo snakes. Fragmented habitat patches probably cannot support a sufficient number of indigo snakes to ensure viable populations.

One of the primary reasons for listing of the species was the pressure on wild populations caused by over-collecting for the pet trade and commerce. Since the listing of the species, private collectors have engaged in a very active captive breeding program to fulfill the desires of individuals wanting specimens for personal pets. The Service controls the interstate commerce of the species via a permit program. The Service believes that this has significantly reduced the collection pressures on the species.

Analysis of the species/critical habitat likely to be affected

The Florida scrub-jay's status since its listing in 1987 has not improved. The status and trends that we discussed above, clearly shows what two items are essential for recovery for this species: (1) additional purchase of scrub lands for preservation in some key areas; and (2) restoration and management of publicly-owned scrub lands already under preservation. Without both, it is unlikely that recovery can be achieved.

The southeastern beach mouse was listed as an endangered species primarily because of the fragmentation, adverse alteration and loss of habitat due to coastal development. The threat of development related habitat loss continues to increase. Other contributing factors include low population numbers, habitat loss from a variety of reasons (including hurricanes), predation or competition by animals related to human development (cats and house mice), and the existing strength or lack of regulations regarding coastal development.

The eastern indigo snake's status since its listing in January 1978 has significantly improved. The captive breeding program has decreased the over-collection of the snake from the wild. However, habitat destruction is still taking place throughout their range and without protection of their natural habitat they may continue to decline.

Environmental Baseline

Action Area

The action area for this biological opinion is defined as CCAFS

Status of the Species in the Action Area

The Florida scrub-jay population on CCAFS was approximately 276 birds in 2003 and 2004. The number of jays decreased slightly (9%) over the last year and their current population is at its lowest in the past ten years. The trend in population size over the last ten years has been downward, with an occasional increase in numbers within the ten year study. The smaller population size was partly due to low reproductive success in 2002 and 2003. In 2002 and 2003, nesting pairs fledged at a rate of 40% and 44% respectively. Significant numbers of young were lost after they fledged (about 50%), likely due to predation. Adult survivorship was 74% between 2003 and 2004 which is about average for the eight years of study, breeder survivorship was slightly higher than average (81%), juvenile survivorship was above average (68%). Forty-seven percent of the 91 nesting groups produced young, yielding 73 juveniles by the end of the breeding season.

The southeastern beach mouse is found along the entire reach of coastline on CCAFS, in addition to the Kennedy Space Center and Cape Canaveral National Seashore. The known distribution is a result of cursory surveys and intermittent trapping involving different construction projects. There has not been a systematic trapping study done in order to determine the status throughout its range on these Federal lands. An ocular survey was conducted in the action area, and burrows were observed on three of the four pipeline corridors. It is presumed this species is found within the action area.

The eastern indigo snake is assumed present within the boundaries of the project site due to the presence of suitable habitat although none have been seen. The eastern indigo snake standard protection measures will be used during the construction of the project.

Factors affecting species environment within the action area

Federal actions have taken place within the action area that has impacted Florida scrub-jays, the southeastern beach mouse, and the eastern indigo snake. These projects resulted in incidental take through section 7 of the Act. The impacts associated with these projects resulted in the loss of occupied habitat within the action area. However, the adverse effects of these projects were off-set through on-site preservation and improvement of scrub habitat; resulting in a net increase in scrub habitat under active management.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the species and its interrelated and interdependent activities. To determine whether the proposed action is likely to jeopardize the continued existence of threatened or endangered species in the action area, we focus on consequences of the proposed action that affect rates of birth, death, immigration, and emigration because the probability of extinction in plant and animal populations is most sensitive to changes in these rates.

Factors to be considered

The effects of the proposed project of the Florida scrub-jay, southeastern beach mouse, and the eastern indigo snake may occur as direct and indirect effects.

Direct Effects

The installation of the 25' tall antenna with eight guy wires may result in the direct "take" of Florida scrub-jays, southeastern beach mice, and eastern indigo snakes as a result of habitat loss. The project will result in the inadvertent injury or death of Florida scrub-jays, southeastern beach mice, and eastern indigo snakes that may be found within the action area. It is possible that as construction proceeds, they will move away from the construction site; however, the Service anticipates that "take" will occur.

The proposed activity will result in the direct, permanent loss of 0.28 acres of scrub habitat utilized by two groups of jays and containing four small unconfirmed southeastern beach mouse burrows. Impacts to the species will be minimized by restoring 1.12 acres of scrub habitat within the action area.

Indirect Effects

The eight guy wires which support the 25' tall antenna may result in an indirect effect due to jays (adults and juveniles) impacting these wires during flight.

Cumulative Effects

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Service has considered cumulative effects with respect to this project and determined they do not apply in this instance.

Conclusion

After reviewing the current status of the Florida scrub-jay, the southeastern beach mouse, and the eastern indigo snake, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the proposed project is not likely to jeopardize the continued existence of the Florida scrub-jay, the southeastern beach mouse, and the eastern indigo snake. No critical habitat has been designated for the three species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation under section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply.

The Federal agency has a continuing responsibility to regulate the activity that is covered by this incidental take statement. If the agency (1) fails to assume and implement the terms and conditions or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental

take, the agency must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. (50 CFR 402.14(I)(3))

Sections 7(b) (4) and 7(o) (2) of the Act do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that the Act requires a Federal permit for removal or reduction to possession of endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any State or in the course of any violation of a State criminal trespass law.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service has reviewed the biological information for this species, information presented by the representatives for the agency, and based on our review; incidental take in the form of harm or harassment is anticipated for the two groups of Florida scrub-jays, all the southeastern beach mice, and all of the eastern indigo snakes utilize the 0.28 acres. If during the course of this action, this level of take is exceeded; such take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide modification of the reasonable and prudent measures.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

When providing an incidental take statement the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take along with terms and conditions that must be complied with, to implement the reasonable and prudent measures. Furthermore, the Service must also specify procedures to be used to handle or dispose of any individuals taken. The Service believes the following reasonable and prudent measures are necessary and appropriate to reduce take:

Florida scrub-jay

1. Avoid potential for Florida scrub-jays to be injured or killed by heavy equipment and the destruction of active nests, with or without eggs.
2. Notify the Service of any unauthorized take of Florida scrub-jays.

Southeastern beach mouse

1. Avoid potential for southeastern beach mice to be injured or killed by heavy equipment and the destruction of burrows.
2. Notify the Service of any unauthorized take of southeastern beach mice.

Eastern Indigo Snake

1. The agency should avoid the potential of eastern indigo snakes to be injured or killed by heavy equipment. This can be avoided by following the standard protection measures.
2. Only individuals with permits should attempt to capture the eastern indigo snakes.
3. If an eastern indigo snake is held in captivity it should be released as soon as possible in release sites.
4. Appropriate monitoring should occur.

TERMS AND CONDITIONS

To implement the above reasonable and prudent measures, the Service has outlined the following terms and conditions for incidental take. In accordance with the Interagency Cooperation Regulation (50 CFR 402), these terms and conditions must be complied with to implement the reasonable and prudent measures for incidental take:

Florida scrub-jay

1. If clearing of habitat occupied by Florida scrub-jays is to occur within the species' nesting season (typically March 1 through June 30), that area should be surveyed prior to clearing to determine if there are any active scrub-jay nests located within the vegetation. If an active scrub-jay nest is located, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or until it has been determined that the nest has failed. Once it has been determined that the nest is no longer active than the habitat is considered not occupied by the Florida scrub-jay.
2. Prior to land clearing, 1.12 acres of scrub habitat has to be restored onsite or at a minimum, time specific plans to restore scrub habitat be made available to the Service.
3. If a dead Florida scrub-jay is found on the project site, the specimen should be thoroughly soaked in water and frozen, and the applicant should notify the Jacksonville Field Office immediately at (904) 232-2580.

Southeastern beach mouse

1. If a dead southeastern beach mouse is found, the animals should be frozen and our office contacted as soon as possible (904-232-2580).

Eastern indigo snake

1. An eastern indigo snake protection/education plan shall be developed by the applicant for all construction personnel to follow. The plan shall be provided to the Service, for review and approval at least 30 days prior to any clearing activities. The educational materials for the plan

may consist of a combination of posters, videos, pamphlets, and lectures (e.g., an observer trained to identify eastern indigo snakes could use the protection/education plan to instruct construction personnel before any clearing activities occur). Informational signs should be posted throughout the construction site and contain the following information:

- a. a description of the eastern indigo snake, its habits, and protection under Federal Law;
- b. instructions not to injure, harm, harass or kill this species;
- c. directions to cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site on its own before resuming clearing; and,
- d. telephone numbers of pertinent agencies to be contacted if a dead eastern indigo snake is encountered. The dead specimen should be thoroughly soaked in water, and then frozen.

2. Only an individual who has been either authorized by a section 10(a) (1) (A) permit issued by the Service, or authorized the Florida Fish and Wildlife Conservation Commission for such activities, is permitted to come in contact with or relocate an eastern indigo snake.
3. If necessary, eastern indigo snakes shall be held in captivity only long enough to transport them to a release site; at no time shall two snakes be kept in the same container during transportation.
4. An eastern indigo snake monitoring report must be submitted to the appropriate Service Field Office within 60 days of the conclusion of clearing phases. The report should be submitted when any eastern indigo snakes are observed or relocated. The report should contain the following information:
 - a. any sightings of eastern indigo snakes;
 - b. summaries of any relocated snakes if relocation was approved for the project (e.g., locations of where and when they were found and relocated);
 - c. other obligations required by the Florida Fish and Wildlife Conservation Commission, as stipulated in the permit.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than two groups of Florida scrub-jays, and all the southeastern beach mice, and all eastern indigo snakes utilizing the 0.28 acre area will be incidentally taken. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to use their authority to further the purposes of the act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the conservation recommendations carried out.

1. Further research efforts for the effects of trapping and soft release on the southeastern beach mouse.

REINITIATION OF SECTION 7 CONSULTATION

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required when discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Sincerely,

Don Palmer
Don Dave Hankla
Field Supervisor

cc
Joe Johnston-ES, Atlanta RO

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Dave Hankla
Field Supervisor

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Appendix C

Agency Consultation

-----Original Message-----

From: AnnMarie_Maharaj@fws.gov [mailto:AnnMarie_Maharaj@fws.gov]
Sent: Tuesday, August 16, 2005 9:40 AM
To: Chambers Angy L GS-12 45 CES/CEVP
Subject: Re: Lightning Detection Package

Log Number: 05-362.01

Dear Ms. Chambers:

The U.S. Fish and Wildlife Service (Service) Jacksonville Field Office has evaluated the information on the other lightning detector towers proposed, and has determined that no further consultation is necessary for this project.

We have determined that the other lightning detector towers are not likely to adversely affect any federally-listed species, nor have any significant impacts on migratory birds or other Service trust resources. If you have any further questions please contact me at (904) 232-2580 ext. 111.

Sincerely,
Ann Marie Maharaj
U.S. Fish and Wildlife Service
6620 Southpoint Drive, South, Suite 310
Jacksonville, Florida 32216
(904) 232-2580 ext. 111 FAX (904) 232-2404
E-mail: AnnMarie_Maharaj@fws.gov



Jeb Bush
Governor

Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

September 28, 2005

Ms. Angy L. Chambers
Department of the Air Force
45 CES/CEV
1224 Jupiter Street, MS 9125
Patrick AFB, FL 32925-3343

RE: Department of the Air Force – Final Draft Environmental Assessment for the Installation of
the Vaisala 4D Lightning Detection System, 45th Space Wing – Brevard, Osceola, and
Orange Counties, Florida.
SAI # FL200509281553C

Dear Ms. Chambers:

Florida State Clearinghouse staff, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has reviewed the referenced final draft environmental assessment (EA).

The Department (DEP) concurs with the U.S. Air Force's finding of no significant impact and notes that the Air Force will consult with St. Johns River Water Management District and U.S. Army Corps of Engineers staff to obtain the necessary environmental permits for construction activities at Sites 2 and 5.

Based on the information contained in the final draft EA, the state has determined that the proposed federal activities are consistent with the Florida Coastal Management Program (FCMP). The state's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting stage.

Thank you for the opportunity to review the subject document. If you have any questions regarding this letter, please contact Ms. Lauren P. Milligan at (850) 245-2170.

Sincerely,

Sally B. Mann, Director
Office of Intergovernmental Programs

SBM/lm

"More Protection, Less Process"

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